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Prerequisites for reading proficiency in preschoolers

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Prerequisites for Reading Proficiency in Preschoolers

by

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Abstract

The impact of a training program that combined phonological awareness activities with instruction in the alphabetic principle and teaching of basic vocabulary items (Zimmer, 2003) and commonly used words in school (Scarborough, 2003) was evaluated through a repeated measures design with a control group. The intervention targeted low-income preschool English-as-a-second language children (ESL) and low-income English speaking children, as well as middle-class ESL children. The results show that the children participating in the intervention group showed significantly better performance on phonological awareness and trained vocabulary measures than children in the control group. Additionally, ESL trained children demonstrated significantly better performance on sight word recognition than children in the ESL control group. The positive effects of training on selected vocabulary items (Scarborough vocabulary) did not transfer to untrained vocabulary. Educational implications of these findings are discussed.

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Prerequisites for reading proficiency in preschoolers

Introduction

There seems to be high variability across children that enter kindergarten in terms of the skills that are predictive of later school success (Bus, 2001; Reese, Garnier, Gallimore, & Goldenberg, 2000; Zill, Collins, West, & Hausken, 1995). These pre-literacy skills include oral language development, especially vocabulary (Cummins, 1991; Dickinson, McCabe, Anastasopoullos, Peisner-Feinberg & Poe, 2003; Fowler, 1991; Snow, Burns & Griffin, 1998; Walley, 1993) and phonological processing skills, such as phonological awareness (Liberman & Shankweiler, 1985; Torgesen et al., 1999; Wagner & Torgesen, 1987), verbal memory capacity and verbal information processing speed (Baddeley, 1986; Joshi & Aaron, 2000; Lovett, 1987; Wolf & Bowers, 2000). The variability in development of these skills is seen in toddlers coming from middle-class families and demographically diverse homes (Fenson, Dale, Reznick, Bates, Thal & Pethick, 1994; Feldman, Dollaghan, Campbell, Kurs-Lasky, Janosky & Paradise, 2000), but it is predominantly characteristic of children that belong to low-income households (Alexander & Entwisle, 1996; August & Hakuta, 1997; Baker et al, 1995; Hart & Risley, 1995; Pan, Rowe, Spier & Tamis-Lemonda, 2004). Children that are at the low end of the spectrum in terms of preschool vocabulary and phonological awareness skills are less prepared to deal with school curriculum and are considered to be at risk for developing reading problems (Bishop & Adams, 1990; Catts, 1993).

Not much is known about the development of pre-literacy skills in second-language learners (Gerber & Durgunoglu, 2004). However, preschool children that learn English as a second language (ESL) and come from low-income families are considered at significant risk for developing reading disabilities and other academic problems during their primary elementary school years and beyond (Bishop and Adams, 1990; Lonigan, 1994).

The present study evaluates the impact of a training program that combines phonological awareness activities with instruction in the alphabetic principle and teaching of basic vocabulary items (Zimmer, 2003) and commonly used words in school (Scarborough, 2003). The intervention targeted low-income preschool ESL children and low-income English speaking children, as well as middle-class ESL children. All of the components listed above are believed to be crucial to school success. This pretest-posttest design with control groups provides data that can be used to assess the implications of training pre-literacy skills in young ESL children. In addition, this study assists in better understanding the course of early literacy development and the necessary array of conditions to ensure that it proceeds well.

In order to examine effects of ESL/nonESL status, as well as socioeconomic status (low/ middle), groups were selected based on these variables. The following table shows the number of children that participated in the training groups (Table 1). These children were compared to children that are matched for demographic variables (SES) and language status (ESL or English as a first language) (Table 2).

Table 1. Number of children (N) in the training groups:

Training groups	ESL	English speaking children
Low SES	8	11
Middle SES	19	

Table 2. Number of children (N) in the control condition:

Control condition	ESL	English speaking children
Low SES	3	6
Middle SES	7	

All the children participating in the intervention group showed significantly better performance in phonological awareness, trained vocabulary and sight word recognition than children in the control group. Also, ESL children showed large and similar gains on phonological awareness and reading measures compared with the native English-speaking children, but similar or slightly smaller gains on oral language measures.

Literature review

Literacy development in native and second language speakers

Research on literacy stems from two main definitions of the phenomenon (August & Hakuta, 1997). Literacy is defined as either a psycholinguistic process or as a social practice of constructing meaning. These definitions correlate with beliefs about effective literacy instruction (August & Hakuta, 1997). Although most of the literacy research has been conducted with monolingual speakers, specifically monolingual English-speaking children, this research can be meaningful for young second language learners, due to the similarities in the cognitive processes involved. Thus, both definitions of literacy are relevant when examining literacy development in children with diverse linguistic and familial experiences. More research is needed to examine the relationship between first and second language oral language and literacy skills (August & Hakuta, 1997).

As a psycholinguistic process, literacy involves sub-processes such as letter recognition, phonological encoding, decoding of grapheme strings, word recognition, lexical access, comprehension of sentences and so on (August & Hakuta, 1997). This definitional approach tends to support the utility of explicit instruction for these sub-processes, as well as practice to achieve automatic functioning. Researchers in this tradition accept an epigenetic view of reading, assuming that the learner's task is different at different stages of development, hence the teacher's tasks will be different according to the learner's stage of reading development. In light

of this approach, the following questions need to be answered for second-language learners: Should explicit instruction be conducted only in the first language or is it possible to effectively conduct this instruction in the second language? Is there a certain level of second language proficiency needed for successful explicit training of literacy in that language? What age is optimal for reading instruction in a second language? How does age when children receive reading instruction correlate with second language proficiency? Three of these questions will be partially answered in the current study by looking at preschoolers' acquisition of pre-literacy skills in a second language.

The second approach to defining literacy, the social practice view, assumes that "participation in a community that uses literacy communicatively" (August & Hakuta, 1997, p. 54) is the critical prerequisite for becoming literate. Thus instructional practices such as encouraging children to write with invented spelling, exposing children to books by reading aloud, and promoting authentic reading experiences through the use of trade books rather than basal readers, are associated with this definition of literacy. In addition, this position considers that involvement in a literate community is a critical factor in learning literacy and it de-emphasizes the individual learner's role, considering that there are no developmental stages of reading. Although an understanding of literacy seems to be a key prerequisite for further literacy development, this approach cannot explain individual differences in literacy skill for subjects that were exposed to the same social practices. Again, not much is known about the literacy practices in the homes of second language learners. There seems to be considerable variability within ethnic or language groups, although typically the comparison groups are all low-income with low parental education (August & Hakuta, 1997). By comparing acquisition of pre-literacy skill in different socio-economic and language status groups (ESL vs. English as a first language), the current study can fill gaps in the research literature.

Acts of literacy vary from reading a listing in a phone book, to reading a children's book or a dissertation on a chemistry phenomenon. Although different, there are commonalities among these acts: understanding what the text means is an important goal for the reader. As theorists have argued, learning literacy skills involves going through two main stages: learning to decode the print, otherwise referred to as learning to read; and reading to learn, that is, to use "the products and principles of the writing system to get at the meaning of the written text" (Snow, 1998, p. 42; Chall, 1996). The current research will address some of the pre-requisite skills for both stages of becoming literate, so it focuses on teaching both phonological awareness (which correlates with learning to decode a written text) and expanding vocabulary (which correlates more with reading to learn) mainly through teaching critical vocabulary items to second language learners.

Now that we understand what literacy skills are, we can turn to the factors that are known to predict successful reading in monolingual school children and their potential relevance for understanding literacy development for second language learners.

Predictors of reading success and failure

Future successful readers typically arrive at school with a set of prior experiences and well-established skills conducive to literacy (August & Hakuta, 1997). The findings in this area point to an understanding of literacy, phonological processing skills, a certain level of vocabulary development and oral connected discourse skills as being factors that positively correlate with skilled reading (August & Hakuta, 1997). Phonological processing skills include an abstract knowledge of the sound structure of language (phonemic awareness), phonological verbal memory capacity and verbal information processing skills (Wagner & Torgesen, 1987). Oral connected discourse skills are characterized by the ability to use oral language in ways that are adapted to the needs of non-present listeners as well as in ways that honour genre-specific

rules for organizing discourse (e.g. rules for organizing the information in a fictional story vs. a newspaper report) (August & Hakuta, 1997). Thus, giving definitions and effective use of comprehension strategies are shown to be present in good readers when they arrive at school (August & Hakuta, 1997).

Although failure to learn to adequately read in English is present among children of low social risk who attend well-funded schools, the phenomenon is much more pervasive among poor children, nonwhite children and nonnative speakers of English, at least in the United States (August & Hakuta, 1997). For example, the Prospects study in the US provides some measure of achievement in the early grades (August & Hakuta, 1997). Students were tested either in English, or in Spanish, if they were not judged adequately proficient in English, yet the results showed that English-language learners performed considerably below general population norms in both reading and math. For both the English and the Spanish version of the test, performance was strongly and negatively related to the concentration of students from poor families in the school. Although there is an effect for poverty, limited English proficiency also plays a role in lowered scores, as indicated by differences between English-language learners and language-minority students who do not have limited English proficiency, in high-poverty schools (August & Hakuta, 1997). For the purpose of the current study, which is the development of reading skill in preschool children, three of the main factors and variables associated with failure to read are examined. In this study, they are: (a) understanding of literacy concepts; (b) phonological processing skills and (c) vocabulary development in children belonging to families of various levels of SES as well as in monolingual and second language learners. All three factors are very important for reading success in the early stages of reading acquisition, as shown in the detailed discussion to follow. The fourth factor, oral connected discourse skills, correlates with more advanced stages of reading, when children read to learn (Snow, 1998).

Understanding of literacy concepts

Research suggests that young children who come from literate households, whose parents are highly educated or use literacy regularly and who have been read to are most likely to become successful readers (August & Hakuta, 1997). As asserted before, these findings fit well with the view of literacy as a social practice, but psycholinguistic researchers explain that participation in literacy-related practices provides opportunities for children to acquire specific knowledge about language, letters and symbolic systems that are pre-requisites to skilled literacy (Bus, 1995; Bus, 2001; Evans, Shaw, & Bell, 2000; Frijters, Barron , & Brunello, 2000).

As there is general consensus that precursors to literacy begin early in infancy (Scarborough, 2002; Whitehurst & Lonigan, 2001), and that early literacy in preschool is related to literacy achievement in school (Aram & Levin, 2004; Levin, Ravid, & Rapport, 2001) and even to higher education (Cunningham & Stanovich, 1997), it becomes important to look at the family variables known to correlate with the development of literacy. Family socio-economic status (SES) seems to be one of the critical variables associated with attaining literacy, as children from low SES communities generally reach a lower level of literacy than their peers from middle or high SES communities. This relationship seems to hold true for different societies and across decades (Aram & Levin, 2001, Bowey, 1995; Clements, Reynolds & Hickey, 2004; Dickinson & Snow, 1987).

The concept of socio-economic status has had " a central and longstanding role" (Gottfried et al., 2003) in the social sciences. It is considered to affect child development directly (proximal factor) or to influence proximal variables like parenting beliefs and practices, thereby affecting child development indirectly (distal factor) (Bornstein, 2002; Eccles, 1993). More research is needed to examine which specific features of SES influence specific aspects of parenting and child development (Bornstein, Hahn, Suwalsky, & Haynes, 2003).

SES is "a multidimensional construct that is indexed by three quantitative factors" (Bornstein et al., 2003, p. 31), namely educational achievement, occupational status and financial income of parents. Education seems to be the most common indicator of SES (Ensminger & Fothergill, 2003; Entwisle & Astone, 1994), as it is associated with many lifestyle traits, suggests level of acquired knowledge and cultural tastes (Liberatos et al., 1988) and is stable in adulthood (Gottfried et al., 2003; Hollingshead, 1975). Maternal education correlates with SES as a whole (r = .69; Bradely, Caldwell, Rock, & Ramey, 1989), and maternal and paternal education are also highly correlated (Kalmijn, 1991).

Occupational status, a second element of SES, is "illustrative of the "skills and power" that people bring to their labor force participation as they function productively in the society" (Bornstein, Hahn, Suwalsky, & Haynes, 2003, p. 31). Although researchers have assumed that it is also normally stable throughout adulthood (Hauser, 1994; Hollingshead, 1975; Otto, 1975), occupation is a somewhat problematic indicator of SES (Entwisle & Astone, 1994), as many women, particularly new mothers, self-exempt from labor force participation (Gottfried et al., 2003), and men's and women's occupations have different prestige and remunerate differently (Crompton, 1993).

Income, the third main component of SES, provides families with the resources they must have to meet the physical and intellectual needs of their children. There is conflicting evidence as to whether income is reliably or meaningfully associated with parenting or child development (Blau, 1999; Duncan & Brooks-Gunn, 1997). Moreover, income exhibits short-term variation (Duncan, 1988), and mother's income may be especially unreliable (Gottfried et al., 2003).

SES seems to have a differential effect on distinct children's outcomes, generally exhibiting a stronger effect on children's school and cognitive achievement than on their social and emotional development (Duncan & Brooks-Gunn, 1997; Haveman & Wolfe, 1995). It is also

known that income effects are strongest during the preschool and early school years (Duncan, Brooks-Gunn, & Klebanov, 1994; Duncan et al., 1998; Smith, Brooks-Gunn, & Klebanov, 1997). But how does SES differentially influence these various outcomes?

There are two main models that explain the impact of childhood experiences in later life: the latency model and the pathways model. The "latency" model emphasizes the view that socio-economic-physical conditions very early in life will have a stronger effect later in life independent of intervening experience. This model builds on the notion of a critical period in development, emphasizing the opportunity to develop a competence that occurs at a discrete and unique time in early life and has a lifelong impact on well-being, independent of experience. Certain early childhood stimulation programs have been effective in improving the life trajectories of disadvantaged children (Palmer, 1979; Schweinhart, Barnes, & Weikart, 1993), even without any attempt to provide them with ongoing support.

The "pathways" model focuses on the cumulative effect of life events and the ongoing importance of socio-economic-physical conditions throughout the life cycle. The researchers in this tradition maintain that a multipronged approach is needed to promote healthy development of children in multiple domains of functioning (Yeung, Linver, & Brooks-Gunn, 2002). The recent New Hope experiment in Milwaukee is an example of such a multipronged program (Yeung, Linver, & Brooks-Gunn, 2002), as it offers low-income working families job search assistance and an earnings supplement that is designed to lift them out of poverty, as well as providing affordable health insurance and child-care assistance on an as-needed basis.

These two models seem complementary to each other. There is no reason to suppose that latent factors only act independently, since an early life event that could exert a latent effect could also be the first step along a lifelong pathway that might have implications for competence and well-being in the future (Hertzman, 1999). At the same time, any early childhood

intervention designed to improve well-being in the long run will occur in a specific context that will provide a mixture of opportunities or barriers. The closer the correlation between early life events and subsequent lifelong pathways, the more difficult it is to statistically estimate the partial contribution of each. For example, results from the Head Start Family and Child Experiences Survey can be interpreted in two ways. One interpretation can accentuate the remarkable improvements of disadvantaged children in the program in relation to the controls, particularly in vocabulary and early writing skills. The alternative analysis would emphasize that although Head Start children do make gains, they still trail their peers nationally when they leave the program (Zill & Resnick, 2005).

This example seems to illustrate the complementary nature of the power of latency, demonstrated by the elements of effectiveness of the targeted "early life" intervention, and the power of pathways, demonstrated by strict limitations to success that existed in the specific context of the study. But the two approaches actually reach ideological conflict (Hertzman, 1999). The latency model can lead to a "vaccination" approach to policy, where SES effects on competence throughout the life cycle need to be addressed through a series of strategies that are highly focused in time and very specific in content. Meanwhile, the pathways approach leads directly to the pursuit of a broad agenda of social reform from cradle to grave. In the light of this discussion, it is relevant to point out that the current study can assist in examining the role of different variables in early literacy development, through a short-duration intervention program targeting specific pre-literacy skills.

We still have to answer the questions regarding the specific mechanisms by which SES exerts its influence on developmental outcomes. The relationship has been less systematically explored, despite the repeatedly documented relation between these two variables (Raviv, Kesenich, & Morrison, 2004). Developmental outcomes result from an interaction of both

proximal and distal environmental factors (Brofenbrenner & Morris, 1998). There is inconsistency in the way that distal variables are defined. For example, distal factors such as SES or neighborhood characteristics are hypothesized to shape psychological or developmental outcomes via environmentally transmitted influences on proximal factors in the home (Huston, McLoyd & Coll, 1997). Gottfried et al. consider that distal variables refer to "the global or descriptive aspects that characterize the environment, but do not measure the specific experiences that impinge on or interact with the child that may affect development" (2003, p. 202). In this case, distal variables are SES, parents' occupation, education etc, and they affect the child's development through the proximal variables.

Proximal variables, which "focus on the process or detailed aspects of the environment, include cognitively enriching and stimulating materials and activities, variety of experiences, parental involvement, social and emotional supports and physical environment" (Gottfried et al., 2003, p. 203). They also include family relationships, which comprise the quality of family interactions and the social climate in the home (Gottfried et al., 2003). Again, different researchers have used different proximal variables among the ones listed above to mediate the relationship between SES and children's outcomes. As in the proposed study we are interested on the effects of family SES on children's educational attainment, we are going to enlist only the related research. Specifically, we are interested in the direct relationships and the mediators between SES and children's cognitive and language competencies, particularly vocabulary development, during the preschool years, as vocabulary development seems to be one of the critical predictors of early literacy (see *Vocabulary* below).

Two main perspectives of the relation between SES and children's development have emerged. One focuses on the effect of income through a family's ability to invest resources into children's development (the investment perspective), whilst the other accentuates the effect of

income through parents' emotional well-being and parenting practices (the family stress perspective) (Yeung, Linver, & Brooks-Gunn, 2002). For an example of the second perspective, Raviv, Kessenich and Morisson (2004) found that children's expressive language, verbal comprehension and receptive verbal conceptual skills (as measured by Reynell Expressive Language, Reynell Verbal Comprehension and Bracken Basic Concepts Scale at 36 months) were correlated with maternal education and income-to-needs-ratio measured when the children were 1 month of age. These effects were mediated by the maternal sensitivity and subscales measuring cognitive stimulation taken from Home Observation for Measurement of the Environment (HOME) at 36 months of age of children. The impact of maternal sensitivity as a proximal intervening variable in the relation between SES and language competencies is supported by research that explains how life stressors may lead to more coercive and irritable parenting, which is in turn associated with less favorable academic and emotional outcomes (Hoff-Ginsberg & Tardif, 1995; McLoyd, 1990). The role of cognitive environment provided by the parent as a mediator in the relation between SES and language development is also supported by research showing that maternal education influences the amount and richness of the language stimulation provided for her child (Hoff-Ginsberg & Tardif, 1995). These variables are known to stimulate language development. Similarly, maternal education correlates with more resources being allocated to the provision of learning experiences and materials, aspects of the home environment that have been shown to affect language abilities of preschool children (Becker & Thomes, 1986; Mayer, 1997).

Yeung, Linver, and Brooks-Gunn (2002) established that factors in the investment perspective, as well as maternal emotional well-being and parenting practices in the family stress perspective mediate the association between income and child well-being, but the mediating process was different for cognitive achievement and behavior problems. Specifically, cognitive

achievement, as measured with letter-word and applied problems, two age-standardized subscales from the Woodcock-Johnson Achievement Test Revised (Woodcock-Johnson, 1989), were better mediated by the investment perspective: higher family income was related to a better physical environment, which then had a direct positive effect on children's applied behavior and letter-word scores. In the meantime, externalizing problem behaviors was better mediated by the family stress model: economic pressure was associated with higher maternal emotional distress, which was associated with behavior problems, both directly and indirectly through punitive parenting practices. This research reveals that there is no single pathway through which family income operates on child outcomes, meaning that different goals can be better attained with a package of services.

Now that the possible pathways between SES and children's outcomes have been examined, it is important to look at the amount of variance accounted for by SES. Gottfried et al. (2003) pointed out that, in their study, where individuals were the unit of analysis, no more than 20% of the variance in intelligence and educational achievement was explained by any one of the SES indicators. This seems to be the pattern of findings when individuals are used as the unit of analysis, as White (1982) showed in a meta-analysis of approximately 200 studies on the relation between SES and academic achievement. Yet, when aggregated units are employed (e.g. language groups in schools or schools as the aggregated unit of the analysis), the correlations increase substantially to more than 20%.

Neighborhood residence seems to be yet another SES distal variable that exerts its influence on child and adolescent development (Leventhal & Brooks-Gunn, 2003). Neighborhood residence may be "a source of SES disparities, as a family's resources constrain where they live" (Leventhal & Brooks-Gunn, 2003, p. 209). An alternative view posits that inequities in family SES are transmitted to parents and their children through various factors, one

of which may be neighborhood residence (Brooks-Gunn, Duncan, & Aber, 1997). Studies on child development find that neighborhood conditions, particularly SES, are partially accounted for by family SES, but also have an independent effect on child and adolescent outcomes (Leventhal & Brooks-Gunn, 2000).

It is difficult to assess the role of a families' SES for children that learn a second language. That is because their SES characteristics need to be considered in the light of the fact that these families have made a transition to a new society, hence many of their SES features (educational level and occupational skills) were developed in countries other than their country of residence. As a result, traditional SES indicators may not have the same meaning for immigrant families as they do for Canadian born families, at least in terms of the environmental features and socialization processes that these factors are thought to capture. For example, for second language learners, the absolute educational level of parents can be both an overestimate and an underestimate of the cognitive stimulation and achievement socialization that takes place in the family (Fuligni & Yoshikawa, 2003). Differential availability of education around the world and the fact that the same level of education does not provide the same amount of cognitive and literacy skills in different countries can lead to underestimation of the human capital among these families. For example, cognitive skills of individuals schooled in North America have shown to be lower than those of individuals with the same levels of education in several immigrant-sending countries, like China and Taiwan (Stevenson & Stigler, 1992). The education levels of parents can overestimate the direct involvement of parents in their children's schooling and instruction (Fuligni & Yoshikawa, 2003). On average, immigrant parents have less familiarity and comfort with the English language, making it more difficult to provide their children with extensive exposure to English on their own (Zhou, 1997). They are also less familiar with the North American schools and instruction (Caplan, Choy, & Whitmore, 1991)

and, as a result, they tend to talk less about their children's school activities (Kao & Tienda, 1995). Therefore, in order to obtain the most accurate assessment of the parenting resources available to children in immigrant families, both the absolute and the relative level of educational attainment in the countries of origin should be considered.

The financial capital that families can offer to their children, as it is measured by income, is also variable in immigrant families, due to the transition to a new society. This measure is not considered the most reliable in predicting the overall SES impact on children's well-being in these families (Fuligni & Yoshikawa, 2003).

To conclude this section on what psychological experiences are afforded to children by families varying in SES, it seems that SES is a "central construct that permeates virtually every aspect of a child's development, a marker variable that tells us where and what to look for in the more immediate environments of children"(Gottfried et al., 2003). It is impressive that a measure of the infants' family SES relates to various aspects of their development at the completion of high school.

In summary, SES is defined by either the family income, by the occupation of one parent or of both parents, by educational level attained by the mother, or by a combination of these three measures. However, it might be more difficult to assess SES by using the family income measure in immigrant families to determine its impact on their children's school readiness skills. To assess SES in this study, the absolute and relative level of education attained by the parents in their country of origin will be evaluated, combined with a measure of the occupation that those parents had held in their countries and in Canada.

Phonological processing skills

The strong association between phonological processing abilities and reading attainment is widely accepted now (Brady & Shankweiler, 1991; Goswami & Bryant, 1990; Liberman &

Shankweiler, 1985; Rack, Hulme, & Snowling, 1993; Wagner & Torgesen, 1987). Researchers agree that the phonological processing skills significantly related to literacy acquisition are phonological awareness, verbal memory capacity and verbal information processing speed (Wagner & Torgesen, 1987; Wagner, Torgesen, & Rashotte, 1994). Other researchers have added phonological learning tasks to these three known phonological processes, arguing that the ability to learn new words is correlated with reading ability (Carroll & Snowling, 2004). We will discuss each of these four skills in detail below.

Phonological awareness. The impact of early phonological awareness (PA) on subsequent reading and spelling in an alphabetic orthography has been repeatedly documented in monolingual research (Bryant, MacLean, Bradley, & Crossland, 1990; Bradley & Bryant, 1983; Lundberg, Frost, & Petersen, 1988; Stanovich, 1992). For example, children who are better at detecting rhymes or phonemes are significantly quicker at learning to read, even after variability due to intelligence (IQ), vocabulary, memory and social class is statistically controlled (Bryant, MacLean, Bradley, & Crossland, 1990; Wagner & Torgesen, 1987). However, the research literature reveals disagreement in how to best conceptualize phonological awareness. Consequently, current definitions of PA can be viewed on a continuum of generality from highly exclusive to highly inclusive of different types of phonological skills (Anthony & Lonigan, 2004), with quite different implications for training phonological skills in children.

The most stringent definition equates PA with the conscious reflection on abstract representations of speech (Anthony & Lonigan, 2004). For example, Morais (1991a) included only phoneme level skills when describing phonological awareness as tasks that involve the manipulation of the phonemes require reflection on abstract representations (Liberman, Cooper, Shankweiler, & Studdert-Kennedy, 1967). Thus, this definition would equate phoneme awareness, which is the ability to consciously reflect on phonemes, with phonological awareness.

This metalinguistic ability develops alongside general metacognitive control processes during middle childhood (Tunmer & Rohl, 1991). The important implication derived from this construal of phonological awareness is that it cannot be trained during preschool years.

A second definition of PA includes all subsyllabic skills in the construct of phonological awareness (Anthony & Lonigan, 2004). The argument is that because subsyllabic units of onset and rhyme are psychologically based (Treiman, 1983, 1985), the cognitive operations involving these word units also require conscious awareness of abstract representations of speech. Hence, phonological awareness is equated with subsyllabic awareness and can be measured by detection or manipulation of onsets, rhymes, vowels or codas, most of which can be more than one phoneme in length. Tasks that involve larger linguistic units (e.g. syllables or words) are excluded, as they reflect sensitivity to acoustic qualities of speech. Once more, this view of phonological awareness is not very helpful for training preschoolers, as this metalinguistic ability develops during early school years.

A third definition maintains that phonological awareness is the capacity to consciously isolate word segments (Morais, 1991b), such as syllables, onsets, rhymes, codas and phonemes. This construal excludes the ability to make judgments of phonological similarity or dissimilarity at any level of word structure, likening phonological awareness with segmental awareness. As this last ability is linked with the development of cognitive analytic abilities and experience or instruction in alphabetic principle (Morais, 1991b; Morais & Mousty, 1992), it is possible to train this skill in school-aged children, but not preschool children.

Finally, Stanovich (1992) claimed that the construct of phonological awareness should not be related to the idea of consciousness, as the last one is hard to operationalize. Instead, he viewed phonological sensitivity as being along a continuum from a shallow sensitivity of large phonological units, to a deep sensitivity of small phonological units. Supporters of this last

definition describe phonological sensitivity as a single ability taking on different forms during its course of development (Adams, 1990; Anthony & Lonigan, 2004; Bradley, 1988; Bryant et al., 1990; Goswami & Bryant, 1990; Treiman & Zukovski, 1991, 1996). Therefore, in early stages, phonological sensitivity manifests in detection of large phonological units, such as words, syllables, onsets and rhymes. In later stages, it manifests in manipulation of phonemes. During their development, children are increasingly sensitive to smaller units: they achieve syllable sensitivity earlier than subsyllabic sensitivity, and they achieve subsyllabic sensitivity earlier than phonemic sensitivity (Anthony, Lonigan, Driscoll, Phillips, & Burgess, 2003; Liberman, Shankweiler, Fischer, & Carter, 1974). For example, results from a meta-analysis conducted by Anthony and Lonigan (2004) reaffirm that rhyme sensitivity, phonemic awareness, and segmental awareness were best characterized as manifestations of the same phonological ability. This implies that phonological sensitivity is "a single ability that can be measured by different tasks (e.g. detection, elision, blending) that differ in linguistic complexity (e.g. syllables, rhymes, onsets and phonemes)" (p. 51). This conceptualization of phonological awareness implies that the concept can be indexed by a variety of measures if administered at the proper point in a given child's development. Considering that pre-readers' phonological sensitivity is an early manifestation of the same ability that plays an important role in learning to read, it is important and plausible to identify early phonological deficits and remedy them before the children experience reading failure and its associated behavioral, social, academic and psychological difficulties (Brown, Palincsar, & Purcell, 1986; Lonigan et al., 1999). The relationship between phonological awareness and literacy will be examined next, as both these concepts have now been defined.

It is known that children who come to school with little awareness of speech sounds are more at risk of developing literacy problems than other children (Elbro, Borstrom, & Petersen,

1998; Liberman, 1973; Shankweiler, 1994; Stanovich, 1986). A child's performance on phonological awareness tasks in kindergarten is the best predictor of reading success at the end of first and second grade (Perfetti, Beck, Bell, & Hughes, 1987; Stanovich, Cunningham, & Cramer, 1984; Wagner & Torgesen, 1987). Moreover, children with reading disabilities and those at risk for reading failure consistently perform more poorly on phonological processing tasks than their typically developing peers (Adams, 1990; Rosner & Simon, 1971; Stanovich, 1986; Vellutino & Scanlon, 1987). Although the research has evidenced the strong correlation between phonological awareness and reading and spelling skills, the nature of this relationship is not clear in the literature. There are three theoretical positions regarding the developmental origins of the phoneme awareness that can be linked to the three theoretical positions defining the relationship between phonological awareness and reading abilities: the accessibility position, the phonological sensitivity approach and the comprehensive language approach (Dickinson, McCabe, Anastasopoulos, Peisner-Feinberg, & Poe, 2003).

The accessibility position states that phonemic segments are pre-formed units that are present and functional from early infancy, but initially, they are available only for basic speech processing tasks, and become accessible at a conscious level only when reading experience with an alphabetic orthography takes place (Rozin & Gleitman, 1977; Liberman, Shankweiler, & Liberman, 1989). This position can be viewed as adevelopmental (Walley, Metsala, & Garlock, 2003), as phonemic segments are not believed to undergo any substantial change in their essential nature. But there is evidence that, before reading ability and independently of it, it is possible to develop phonological awareness, which, in turn, facilitates subsequent literacy acquisition (Bradely & Bryant, 1983, 1985; Lundberg, Frost, & Peterson, 1988; Schneider, Kuspert, Roth, & Vise, 1997).

The phonological sensitivity approach posits that general linguistic abilities, especially vocabulary, provide the critical basis for the emergence of phonological sensitivity, which thereafter is the key language skill in reading acquisition (Bowey & Patel, 1988; Chaney, 1992, 1994; Metsala, 1999; Whitehurst & Lonigan, 2001). For example, Metsala (1999) proposed the "lexical restructuring model" in which rapid expansion of vocabulary forces the representation of increasingly small segments in words. At the very outset of language acquisition, children need to discriminate relatively few unique words, hence quite holistic representations of phonological forms will suffice (Metsala, 1999; Walley, Metsala, & Garlock, 2003). After some threshold of vocabulary development has been achieved, smaller units of words can be represented in phonological loop, although such representations are also held to be word specific, in that words that are encountered many times or acquired early are more likely to become restructured than rarer or later encountered words (Metsala, 1999). This model is supported by evidence that spoken word recognition varies with lexical characteristics that are associated with vocabulary growth and that word recognition contributes to variations in phoneme awareness, which, in turn, are related to early reading ability (Walley, Metsala, & Garlock, 2003). In line with this model, some issues regarding development of phonological awareness in a second language need to be discussed: Is there a certain level of language-specific vocabulary necessary for phonological awareness development in a second language? Can phonological awareness transfer from one language to another, and in what conditions? We will address the first issue in the *Vocabulary* section below and the second one in the section regarding phonological awareness in second language learners.

The last position regarding the emergence and development of phonological awareness is the comprehensive language approach (Dickinson et al., 2003), which states that a variety of oral language skills are critical in emergent literacy and play an important role in subsequent reading

achievement. As this line of research is closely related to vocabulary and its role in literacy development, it will be discussed in the *Vocabulary* section.

Looking at the research discussing the emergence of phonological awareness, it becomes evident that these three different approaches correlate with three different views of the causal relationship between phonological awareness and subsequent reading and writing skills. Thus, the accessibility approach explains that reading is the factor that develops phonological awareness, specifically phonemic awareness (Perfetti, 1985). This position also correlates to some degree with all of the first three definitions of phonological awareness (e.g. phonological awareness as conscious reflection on abstract representations of speech, at the level of either phonemes, subsyllabic units or word segments). The phonological sensitivity approach sees phonological awareness as the cause for literacy development, whereas the comprehensive language approach describes a bi-directional link between phonological awareness and literacy development, as the first is leading the second in early stages of reading, but finer levels of phoneme awareness are achieved as a result of learning to read, at least in an alphabetic orthography, during later stages of reading (Durgunoglu & Oney, 1999; Wagner, Torgesen, & Rashotte, 1994). The implications of these findings for training pre-literacy skills are discussed later in this paper.

Phonological awareness and second language learners. As languages differ in the complexity of their phonological structures and the transparency of their letter-sound correspondences, the nature of the spoken language to which a child is exposed and the characteristics of its orthography can influence the development of phonological awareness. For example, Cossu et al.(1988) attributed a higher level of phonological awareness in Italian than in English kindergarten and elementary children to the relatively limited vowel repertoires in Italian. Research comparing reading development in phonologically transparent orthographies

(shallow orthographies; e.g. Finnish, Italian, Czech, Turkish) and orthographies where the sound-letter relation is substantially equivocal (deep orthographies; e.g. English) suggests that children learning to read shallow orthographies do not require as much explicit instruction in phonological awareness as appears to be valuable for deep orthographic systems (Seymour, Aro, & Erskine, 2003). Liberman and her colleagues showed that English-speaking children manipulate syllables more easily than onset-rimes (e.g. car-toon easier than m-at or c-at) and onset-rimes more easily than phonemes (e.g. c-at easier than c-a-t) (Liberman, Shankweiler, Fischer, & Carter, 1974). The pattern of phonological awareness development for Italian speakers seemed to parallel that of the English speakers, with syllables being processed more easily than phonemes (Cossu et al., 1988). If this is true for other languages, then the pattern of development of phonological awareness is the same across languages, which will permit training phonological awareness in either the native language or the language of instruction for second language learners.

If phonological awareness in one language predicts phonological awareness and /or word decoding skills in the second language, then we say that transfer of phonological awareness skills has occurred. Research with Spanish-speaking and Chinese-speaking children acquiring English as a second language, as well as research conducted with English-speaking children learning French demonstrated cross-language transfer for phonological awareness (Cisero & Royer, 1995; Comeau et al., 1999; Dickinson et al., 2003; Gottardo, 2002; Gottardo et al., 2001). For example, Gottardo (2002) found that phonological processing skill in Spanish correlated with English reading acquisition performance, a relationship reported as well for Chinese speakers learning English (Gottardo et al., 2001). Dickinson et al. (2003) established that highly significant amounts of additional variance in phonological awareness posttest scores in one language were accounted for by the performance in the child's second language, when they controlled for age

and pretest scores of phonological awareness in the same language. These results indicate that stimulation of phonological awareness of bilingual children in either of their languages is likely to transfer to the other language.

Phonological verbal memory capacity. Also called phonological short-term memory, phonological verbal memory capacity is the second of the phonological processing skills that predicts learning to read (Gathercole & Baddeley, 1993; Siegel, 1993; Siegel & Ryan, 1989) and involves the ability to retain verbal information in working memory. Research has indicated that the variance in reading ability predicted by verbal working memory mostly overlaps with the variance accounted for by phonological awareness (Comeau et al., 1999; Hansen & Bowey, 1994; Leather & Henry, 1994; Gottardo, Stanovich, & Siegel, 1996). As children's phonological memory skills and vocabulary knowledge are closely associated with one another (see *Vocabulary* section below), vocabulary might be a mediator for the relation between phonological memory capacity and subsequent reading acquisition.

Phonological learning. The ability to learn new words, which lies at the root of children's language acquisition, can be linked to phonological learning (as learning a new word means acquiring the phonology as well as the meaning of the new word). As the interrelationship between oral-language abilities, particularly vocabulary, and phonological processing skills is clearly related to early literacy skills (see *Vocabulary* section below), it becomes important to identify the psychological processes that underpin the acquisition of vocabulary during early childhood. Knowledge of the sound patterns and meanings of individual words as well as phonological short-term memory are two of the factors related to learning new vocabulary items (Gathercole, Hitch, Service, & Martin, 1997). It is argued that constructing phonological representations of a previously unfamiliar word in lexical memory is deficient in children with reading difficulties (phonological representation hypothesis; Fowler, 1991; Metsala, 1997; Swan

& Goswami, 1997; Snowling & Hulme, 1994; Snowling, Bishop, & Stothard, 2000). Carroll and Snowling (2004) also link one of the strongest early predictors of reading acquisition, namely letter knowledge (Adams, 1990; Muter, Hulme, Snowling, & Taylor, 1998) to phonological learning, in that "to learn a letter's name or sound requires the association of a visual symbol with a novel phonological form" (p. 633). Thus, differences of phonological learning between children with reading difficulties and children developing normally could account for differences in their consolidated knowledge of letters and in their learning of new words (Gathercole et al., 1997; Carroll & Snowling, 2004). For example, Gathercole et al. (1997) found that children's ability to learn the sound patterns of new words was related both to their current knowledge of the native vocabulary and to their capacity to hold phonological material for brief periods in short-term memory. Carroll and Snowling (2004) found that children at high risk of reading problems performed significantly lower on tests of both phonological processing and phonological learning than controls not at risk of reading failure of similar age and educational experience. Phonological learning is particularly important for L2 learning, as both the phonology and the lexical items may be novel (Service, 1992).

Verbal information processing speed. The last of the phonological processing abilities predicting reading skills, verbal information processing speed involves the ability to maintain focus and work quickly through automatic cognitive tasks. Researchers agree that processing speed is an important predictor for reading ability. For example, Konold, Juel, McKinnon, and Deffes (2003) found that processing speed was an important cognitive predictor for proficient reading. Geva, Yaghoub-Zadeh, and Schuster (2000) and Comeau et al. (1999) showed that this cognitive ability appeared to play the second most important role of word decoding ability in both L1 and L2 for children learning ESL and for native English-speaking children learning to read in French, respectively.

In conclusion, the relationship between phonological processing skills and reading acquisition seems to be bi-directional (comprehensive language approach, see *Vocabulary* section), with one leading the other in different stages of development. Phonological awareness is the strongest predictor of future reading skills, followed by processing speed and verbal memory. Research conducted with bilingual speakers demonstrates that phonological processing skills in one language predict word-decoding skills in the other one. In addition, vocabulary exerts an influence on the acquisition of literacy.

Oral language skills – Vocabulary

At every stage of reading development, oral language abilities, particularly vocabulary – knowledge of the meaning of words – is a highly reliable correlate of reading ability (Dickinson et al., 2003; Koda, 1989; Snow, Burns, & Griffin, 1998; Stanovich, 1986). Vocabulary skills of children at high risk of reading disability are poorer than those of controls during the pre-school years (Gallagher, Frith, & Snowling, 2000; Scarborough, 1990). The relationship between vocabulary and reading is easy to understand at later stages, when children read to learn, as they are confronted with many relatively rare and sophisticated words, which are easier to read if already known, thus familiarity with content promotes reading comprehension when reading in either first or second language (Carrell, 1987; Johnson, 1981). Conversely, reading skill assists in vocabulary development, resulting in proficient readers encountering more unfamiliar words in text than poor readers who read less and less frequently (Stanovich, 1986).

There are two main models that explain this relationship in the early stages of reading, the phonological sensitivity approach and the comprehensive language approach. Since the first model was discussed in the *Phonological processing skills* section in detail, it will be briefly reviewed. The phonological sensitivity approach states that general linguistic abilities, especially vocabulary, provide the basis for the emergence of phonological sensitivity, which in turn is the

key language skill in reading acquisition (Bowey & Patel, 1988; Chaney, 1992, 1994; Metsala, 1999; Whitehurst & Lonigan, 2001). This position implies that a certain level of vocabulary is necessary for the development of phonological awareness in a second language, unless phonological awareness transfers from one language to the other.

The comprehensive language approach (Dickinson et al., 2003) views vocabulary and phonological awareness as the critical factors in emergent literacy and subsequent reading achievement. It states that both aspects of children's language are closely related to each other and that print knowledge is related to both language skills. For example, Dickinson et al. (2003) found that among 3- and 4-year-old children included in a Head Start program, vocabulary played a role equal to that of phonological awareness in predicting print knowledge. Children that showed a deficit specific to phonological awareness also showed an altered pattern of association between vocabulary and phonological awareness, and between these language skills and early literacy. That is, among children with the lowest phonological awareness scores, the relationship between language and literacy was modified such that vocabulary predicted word decoding skills less than in children with normally developing phonological awareness. The same relation held true for children displaying very limited vocabulary development. An implication of this research is that vocabulary and other language skills should not be seen as capacities that are needed only for the development of phonological awareness, but rather as one of the two critical skills to successful reading (Storch & Whitehurst, 2002; Dickinson et al., 2003).

There is marked variability across children in their vocabulary acquisition during their first three years of life (Pan et al., 2004). Individual differences in vocabulary growth have been shown to be reliably related to demographics (Snow et. al., 1998). For example, Graves and Slater (1987) found that first graders from higher-income backgrounds had about double the

vocabulary size of those from lower-income households. Higher SES mothers tend to sustain conversations with their children for longer periods of time, elicit more talk from their children and respond to their children in a more contingent manner (Farran & Ramey, 1980; Hoff, 2003; Hoff-Ginsberg & Tardif, 1995). Hart and Risley (1992) found that SES level was highly correlated with the number of words spoken per hour by the parent and that substantial variability existed in the amount of language exposure children received: in a typical hour-long observation period, the average welfare parent addressed 616 words to their child, while the average professional parent uttered 2153! Pan et al. (2004) found that by age 3, maternal education, an index of SES, was positively associated with children's receptive vocabulary when using multiple sources of data for assessing vocabulary of children.

Scarborough (2003) proposed that children coming from low SES families lack knowledge of critical vocabulary concepts in the domains of space relations, time/order relations, quantity and logic relations, that put them at disadvantage for further learning. When these children start reading, they transition linguistically from a colloquial language to a more abstract, formal and decontextualized language, with unfamiliar terms and sentence construction and unfamiliar discourse requirements. As a result of encountering this linguistic complexity, reading becomes a difficult skill to attain for these children.

If vocabulary has such an important role for reading acquisition in monolingual children, does the relationship hold true for second language learners? There is considerable controversy about the level of second language oral proficiency needed to support reading in that language (August & Hakuta, 1997). For example, Wong Fillmore and Valadez (1986) and Cummins (1984) maintain that second language reading in English should not be introduced until a fairly high level of English oral proficiency has been achieved. Other researchers have argued that instruction focused on second language comprehension can be helpful to learners at all levels of

second language oral proficiency (Anderson & Roit, 1996; Gersten, 1996), and in fact that support of second language reading comprehension can generate gains in oral skills in the second language (Elley, 1981).

To conclude the section on factors related to successful reading acquisition, phonological processing skills, vocabulary and early literacy experiences seem to be critical predictors of literacy development in early as well as late stages. Decoding skills seem to correlate more specifically with phonological processing skills, while text comprehension seems to be related more with vocabulary knowledge. Nevertheless, there seems to be an interrelationship between vocabulary and phonological processing skills when predicting future reading skills, as the comprehensive language approach posits (Dickinson et al., 2003). To strengthen the bi-directional link between phonological awareness and vocabulary, on one hand, and future reading skills, on the other hand, we will next examine training studies aimed at preventing reading difficulties.

Early intervention programs

Training studies designed to prevent reading failure have been mostly conducted with monolingual children (Gerber et al., 2004). The vast majority of early intervention programs targeted phonological processing and alphabetic skills, as training in phonological awareness has generally been shown to be more effective when it is combined with the teaching of reading (Bradely & Bryant, 1983, 1985; Byrne & Fielding Barnsley, 1991, 1993; Cunningham, 1990; Hatcher, Hulme, & Ellis, 1994; Elbro & Petersen, 2004). Findings of the National Reading Panel support this view: the mean effect size on reading for training programs that made explicit links with letters as the sound symbols (d = .67) was larger than that for phonological awareness training alone (d = .38) (Bus & van IJzendoorn, 1999). Such programs were very helpful in low SES kindergartens (Aram & Biron, 2004; Baker & Smith, 1999; Schneider, Roth, & Ennemoser,

2000), as well as in middle SES kindergartens (Ball & Blachman, 1991; Ukrainetz, Cooney, Dyer, Kysar, & Harris, 2000).

Phonological awareness skills in such interventions were taught using rhyme and phoneme training programs in relation to the alphabetic principle in sessions varying from three 10 minutes per week for 14.5 months to 30 minutes every day for 17 weeks. For example, Hatcher et al. (2004) used a rhyme programme involving a graded sequence of word, syllable, rhyme awareness and rhyme production tasks, and a package of phoneme and phoneme-linkage training. These two main programs were combined to obtain four programs. The two main programs were comprised of the following sequenced activities: identification of words as units within the sentences, identification and manipulation of syllables, discrimination of rhyming words, phoneme blending, identification and discrimination of phonemes, rhyme correction and supply, phoneme segmentation, phoneme deletion, phoneme substitution and rhyme linkage. They found that children in only the two of four programs that explicitly linked phonemes to print made significant gains in word reading.

Elbro and Petersen (2004) focused on single speech sounds right from the start, vowels being introduced during the first two weeks of the program, and consonants being presented in groups of two per week, for the following 15 weeks. First, the sounds were introduced with a semantic cue (e.g. "ssss" as the sound that a snake makes) and then the corresponding letter was shown and named for the children. Each sound was also presented in children's poems and in person names, while encouraging the children to find other words and names that started with that sound. Then, the children were given some articulatory cues to the sound and the significance of the new sound was taught in minimal pairs (e.g. mail vs. snail), where the rime was represented on the blackboard as a box, and the onset with real letters. Letter-sound training did not take place in the context of whole printed words. They found that the effects of phoneme

awareness training were significant even 7 years after the completion of the program, with positive effects being more noticeable for decoding accuracy than for decoding speed (latency effects). When these studies are conducted with children that are at risk for reading problems, the results show that the trained at-risk children outperform the untrained, at-risk children, but they lag behind a second control group of not-at-risk for reading failure children (Elbro & Petersen, 2004).

Yet another study compared a joint storybook intervention with a joint "writing" program, both conducted with 3-5 years old children for a total of 66 sessions (20-30 minutes/session, twice a week) (Aram & Biron, 2004). The joint reading program utilized 11 children's books for focusing on language and exploring major concepts found in these books, while the writing program encouraged letter knowledge, phonological awareness and functional writing activities. In the latter program, children were first taught to recognize their written name and the written names of their friends (Adams, 1991, Share & Stanovich, 1995); gradually, they were taught word segmentation, letter-name and letter-sound correspondence and blending skills using mostly their names as words for practice. Children were also encouraged to actively practice writing and forming letter shapes using stickers, magnetized letters, newspaper cuttings, crayons etc. Thus, the two programs emphasized different aspects of literacy: language and storybook reading versus alphabetic skills and phonological awareness. The results indicate that children from low SES families in the two literacy programs progressed significantly more than the control group on orthographic awareness, however, the joint writing group significantly outperformed both the joint reading group and the control group on phonological awareness, word writing, orthographic awareness and letter knowledge. Also, the younger group (3-4 years old) learnt more new words during the interventions than did the older group (4-5 years old),

supporting Whitehurst et al.'s (1999) finding that reading programs are more productive for preschoolers than for kindergartners.

Vocabulary training studies emphasize that instruction needs to target oral language development from preschool through high school. For example, Foorman and Pollard-Durodola (2004) stress that incidental teaching of new words during everyday conversations and direct teaching of rare spoken and printed words are both necessary for successful teaching of vocabulary. They developed a vocabulary enrichment program where classroom teachers taught 15 words per week for 30 minutes/day for 20 weeks. Their results show that low SES high-risk children in the intervention had a significant growth of vocabulary compared to children in the untrained control group.

There seems to be a dearth of research on training prerequisites of reading acquisition in English language learners (L2) (Gerber & Durgunoglu, 2004). Thus, Slavin and Cheung (2003) found only 11 studies of beginning reading programs for English L2 learners. Although "literature tends to support application of many of the same instructional strategies and methods that have been validated for monolingual learners" (Gerber & Durgunoglu, 2004, p. 199), the specifics of early acquisition of early reading skills in L2 learners are not entirely known. For example, D'Angiulli, Siegel, and Maggi (2004) showed that literacy-intensive instruction was beneficial for L2 children, despite economic disadvantage (Gerber & Durgunoglu, 2004). Manis, Lindsey, and Bailey (2004) showed that foundational skills in a first language, such as phonological processing, become important cognitive resources for students as they transitioned to reading in their L2 (Gerber & Durgunoglu, 2004). Thus, phonological processing skills, which are predictive of reading success in monolingual readers, may be important predictors of reading success in English L2 learners as well. Nag-Arulmani, Reddy, and Buckley (2003) showed that the non-dominant English L2 children in the group that received explicit phonological instruction

performed significantly better in reading and spelling measures than both the language proficiency group and the reading difficulties control groups, but did not reach the levels of the no reading difficulties group, paralleling the findings with monolingual learners (Elbro & Petersen, 2004). However, the phonological intervention in this study did not have any explicit orthography-phonology or letter-sound linkage activities.

Yet another training study for English L2 learners was conducted that enhanced L1 (Spanish) phonological awareness (Gerber et al., 2004). The program lasted for 10 half-hour intervention sessions and used the principles of direct instruction (skills were divided into hierarchical steps and taught to a mastery criterion, using rapid pacing, large number of individual or group response opportunities in small, relatively homogeneous groups; Swanson & Hoskyns, 1990). Gerber et al. (2004) report that the kindergarten intervention students judged as being at risk for English reading failure substantially closed the initial gap in performance on phonological and word reading tasks between them and their better performing peers. In conclusion, instruction in phonological awareness linked with instruction in the alphabetic principle and vocabulary training seems to be beneficial for reading acquisition for both L1 and L2 learners.

To summarize, phonological awareness and vocabulary play a major role in the development of reading skills, as shown by correlational and experimental studies (Brady & Shankweiler, 1991; Carroll & Snowling, 2004; Dickinson et al., 2003; Liberman & Shanweiler, 1985; Stanovich, 1992; Wagner & Torgesen, 1987). Children that belong to low SES families and/or have an ESL status are considered at significant risk for developing reading difficulties in the primary school years and beyond (Aram & Levin, 2001; August & Hakuta, 1997; Bishop & Adams, 1990; Catts, 1993; Dickinson & Snow, 1987; Perfetti, Beck, Bell, & Hughes, 1987;

Stanovich, Cunningham, & Cramer, 1984). Not much is known about the development of literacy skills in second language learners (Gerber & Durgunoglu, 2004).

The current study examined the efficacy of a training program in phonological awareness and vocabulary for children that belong to either low SES, English speaking families, low SES, ESL families or middle SES, ESL families. The main comparison analyzed children that received training versus children that did not receive training, but belonged to similar language status (English versus English as a second language) and SES status groups. Interactions between language status (LS), SES and training assisted in determining the relative effectiveness of the training programme for the children from the three groups of interest. Thus, the present study can help in answering some of the questions related to training better pre-literacy skills in young ESL children, such as: What is more important when assessing reading difficulties in ESL children: their ESL status or their families' SES status? Is prior experience with the second language needed for successful explicit training of literacy in that language? What is the relationship between phonological awareness and vocabulary in second language learners and the relationship between these crucial components for future development of reading skills in second language learners?

Hypotheses

The present study examined the effects of phonological awareness (PA) coupled with oral vocabulary and sight-word training in preschool children coming from diverse SES status and ESL versus non-ESL status (see tables below). Specifically, it was hypothesized that all the children participating in the intervention would show significantly better performance in phonological awareness, trained and untrained vocabulary and sight word recognition than children in the control group. Also, children from low SES English-speaking and ESL families

would show greater gains in English measures of skills related to reading proficiency than children coming from middle class ESL families.

The following table shows the number of children that participated in the training groups (Table 1). These children were compared to children that were matched for demographic variables (SES) and LS (ESL or English as a first language) (Table 2).

Table 1. Number of children (N) in the training groups:

Training groups	ESL	English speaking children
Low SES	8	11
Middle SES	19	

Table 2. Number of children (N) in the control condition:

Control condition	ESL	English speaking children
Low SES	3	6
Middle SES	7	

The first hypothesis was generated from findings related to PA and vocabulary in monolingual learners, as well as by the results on reading development of training these skills in monolingual and bilingual learners. These findings indicate that PA and vocabulary are crucial in the development of pre-literacy skills (Brady & Shankweiler, 1991; Carroll & Snowling, 2004; Dickinson et al., 2003; Liberman & Shankweiler, 1985; Stanovich, 1992; Wagner & Torgesen, 1987). The second hypothesis was generated from the results of studies that looked at SES and literacy skills in monolingual learners: children that belong to lower SES families tend to develop lower reading skills than their higher SES counterparts. The results show that precursors of decoding, such as phonological awareness and letter-sound identification skills, can be successfully trained in various LS and SES groups of very young children (3 ½ to 4 ½). Specific

vocabulary items, such as Scarborough vocabulary, can be effectively trained as well in such a sample. Large differences in vocabulary acquisition exist between children from various SES and LS status. These differences are known to exert an important effect on later stages of reading.

Participants

Thirty-eight preschool children (3.5 to 4.5 year old) children were trained in the experimental group (see Table 1 above). The children in the experimental group attended the program twice a week, for 2 hours, for a total of eight weeks. To accommodate 38 children, the intervention was offered at three different points in time. A control group of children that attended programs in the Hamilton, Kitchener, Cambridge and Waterloo Ontario Early Years Centre (OEYC), as well as various child care centres in Kitchener and Waterloo served as the comparison group (see Table 2 above). The children in both experimental and control conditions were recruited from the following three groups: low-income inner city families that had L1 other than English; low-income families that spoke English as their first language; middle-class families that had L1 other than English. The children in the experimental group were trained in mixed language and SES groups, for recruitment reasons, as well as for more naturalistic conditions reasons (in a typical classroom setting, children of various SES and language status take part in the instructional activities). The control group was matched for demographic and linguistic variables with the experimental group.

Measures (see Table 3)

Parent-Home Questionnaire (see Appendix 1). The Parent-Home Questionnaire was used to assess family SES in the country of origin as well as in Canada. For example, by answering questions in the questionnaire, parents provided information regarding their last school grade completed, their occupation in their country of origin as well as in Canada and so on.

Table 3. Measures with their measured construct

Construct measured	Measure
1. SES	Parent Home Questionnaire
2. Word reading	Word Identification (WRMT-R, 1987)
3. Pseudoword reading	Word Attack (WRMT-R, 1987)
4. Phonetic and sight word reading	Dolch words (May & Rizzardi, 2002)
5. Phonological awareness	Phoneme detection
6. Phonological awareness	Rime detection
7. Phonological awareness	Sound blending
8. Phonological awareness	Syllable and phoneme elision
9. Phonological learning	The Gruffalo (pretest) and the Son of the Gruffalo (posttest)
10. Receptive vocabulary	PPVT-III (Dunn and Dunn, 1997).
11. Commonly used words in school	Scarborough vocabulary (Scarborough, 2003)
12. Letter-sound knowledge	Letter-sound naming
13. Pseudoword repetition	Pseudoword repetition (CTOPP, 2001)
14. Real word repetition	Short list repetition
15. Visual processing speed	Visual Matching (WJ-R COG; Woodcock & Johnson, 1989)
16. Phonological representations processing speed	Picture naming speed
17. Non-verbal reasoning	Block Imitation Design (WPPSI, Wechsler, 1989)
18. Classroom pre-readiness skills	Name recognition

Reading Measures. Standardized tests of English word and pseudoword reading were administered in each testing session to assess reading skills. Word reading was measured using the Word Identification subtest of the Woodcock Reading Mastery Test-Revised (WRMT-R) (Woodcock, 1987). Pseudoword reading was measured with the Word Attack subtest of the WRMT-R.

A battery of pre-primer and primer sight words (Dolch words) was used additionally to test English word reading skills (May & Rizzardi, 2002). These words are very frequent in children's books; some of them do not follow phonetic decoding rules (e.g. "four" and "for", "blue"), but some of them follow phonetic decoding rules (e.g. "red", "and", "big"). The Dolch list of words was divided in this way for the analysis, due to the fact that children might use different strategies to read these different types of words.

Phonological processing measures. The measures that were administered were: phoneme detection, rhyme detection, syllable and phoneme elision and sound blending (to assess phonological awareness), as well as phonological learning skills. A phoneme detection task was administered which required the participants to select the pseudoword in a list of three pseudowords that started with a different phoneme from the other two pseudowords (Bradley & Bryant, 1983, Stanovich, Cunningham & Cramer, 1984). The children were asked to select the illustrated item that matched with the pseudoword. The pseudoword test was used to control for known vocabulary effects. Given that the items were English-like pseudowords, they were represented as "silly creature" names with accompanying "creatures" illustrations. The examiner pointed to each creature when presenting the pseudoword items to the children. The children were asked to select which of the three creatures had a "different sounding" name (e.g., Which creature has a different sounding name: nad, nam, sler?). They were cued to listen for the beginning of the word. The use of a pointing response eliminated the need for verbal retrieval of the pseudoword item. All fifteen items were administered to all of the participants. A rhyme detection task using pseudowords was administered in the same way. The children were asked to select which of the three creatures had a "different sounding" name (e.g. Which creature has a different sounding name: nad, gad, sler?). They were cued to listen for the end of the word.

Selected items from the Auditory Analysis Test (AAT), an elision task, were administered to the participants. The participants were asked to delete syllables and single phonemes from initial and final positions in words to form another word (Say gate. Say it without the /g/. Say please. Say it without the /z/.)

Sound blending was assessed using the subtest with the same name from Woodcock Diagnostic Reading Battery (WDRB, Woodcock, 1997). Children were asked to form a word when two or more phonemes of the words were given (e.g. "If you put "p" and "en" together, what will you get?").

To assess phonological learning skills the children were presented with six new words to learn, embedded in the narrative of a storybook, *The Gruffalo* (Donaldson & Scheffer, 1999), for the pretest condition, and *The Son of the Gruffalo*, (Donaldson & Scheffer, 2001), for the posttest condition. The first story describes a monster named Gruffalo and then follows a mouse in his search for the monster in the forest. The second story describes Gruffalo's son looking for the mouse monster in the forest. Six words were selected from the description of the Gruffalo or the mouse, respectively, to be the target words; four of these were changed from the words in the published story into words not likely to be known by young children. Real words were used for ethical reasons, as this task was a vocabulary learning task as well (as per Carroll & Snowling, 2004). Practice items with known words were given at the beginning of testing to ensure that the children understood the task. Then they were asked to point to each of the target parts of the picture in turn (e.g. Can you see his *talons*?) and were given corrective feedback. Scores on this part of the test formed the pre-test score. Then the story was read to the child with him/her looking at the pictures. To ensure that the children were attending to the task, they were given two informal questions during the book reading (e.g. What animal is this? Why is it running away?). In the Caroll and Snowling (2004) study, most of the children found those questions

easy. Each of the target words was included twice in the story, with an illustration of the word. Immediately after the first reading of the story, the children were asked to point to the target areas of the picture, in the same manner as they would have done it in the pre-testing. Corrective feedback was given again. After spending at least 30 minutes on other tasks, the children were tested for the target words and given corrective feedback; their performance was recorded as the "recall score". Finally, they were read the story again and given another recognition test using the picture of the Gruffalo; responses were recorded for the "recognition score".

Oral language measures. Oral language proficiency was measured using two vocabulary tasks and a Grammatical knowledge task. The first task tested receptive vocabulary using the Peabody Picture Vocabulary Test – III (PPVT-III) (Dunn and Dunn, 1997). In PPVT-III the participant selected the correct picture to match the orally presented word. The second task was derived using the commonly used words in school (Scarborough, 2003) (see Appendix 2). It tested receptive vocabulary by asking the children to perform an action (e.g. Put the shoes on the book). Grammatical knowledge was measured using the Test of Auditory Comprehension of Language-3 (TACL-3) (Carrow-Woolfolk, 1999).

Letter-sound naming. The children were asked to name all 26 letters of the English alphabet, presented in fixed random order. Then they were asked to provide the sounds of each letter. Letter knowledge is considered a significant predictor of phoneme awareness gains for the normally developing children (Elbro & Petersen, 2004).

Verbal short-term memory measures. Pseudoword repetition is a task that consistently distinguishes normally developing children from children with language difficulties in the school years (Bishop, North & Donlan, 1996). The test (CTOPP) consisted of 12 one to five syllable nonwords.

Short list repetition task measured verbal short-term memory using real words. The list was comprised of 2 high-frequency one, two-, three- and four-syllable words, 2 for each condition, for a total of 16 words presented in six pairs of two words each.

Processing speed measures. Processing speed was measured with the Visual Matching subtest from the Woodcock-Johnson Tests of Cognitive Ability (WJ-R COG; Woodcock & Johnson, 1989). This subtest measures visual processing by requiring children to identify and mark two identical numbers in a row that contains six numbers.

Picture naming speed is a measure of the ease of access to phonological representations of words (Elbro, 1990). Each child was asked to name as accurately and quickly as possible 30 different pictured objects presented. The pictures had names that are in the vocabulary of 3 year-old children (e.g. cat, dog, bed, chair, tree, house, car). The score was reported as time in seconds.

Non-verbal reasoning. Nonverbal reasoning was assessed using the Block Imitation Design subtest of the Wechsler Preschool and Primary Scale of Intelligence (WPPSI) (Wechsler, 1989). The children were asked to imitate a block pattern that is presented to them using blocks that were either red or white or red and white.

Name recognition. Name recognition was assessed as a classroom pre-readiness skill. The children were asked to select their name from a display of three names. The other two names in the display contained the same first letter and a random vowel/consonant changed from the original name for each of the children.

Procedure

The study included a pretest-posttest design with a control group. The training program lasted 8 weeks and was conducted for 2 days a week, 2 hours a day for three sessions; the adult:child ratio was 4:20 in the experimental groups, although for the analysis data was

collapsed into one experimental group. The children were assessed before and after the implementation of the program on the English measures of phonological processing, phonological learning skills, processing speed, verbal short-term memory, trained and untrained vocabulary and reading outcome measures described above. At each time, the children received the battery of tests during two sessions, with each session lasting approximately 60 minutes. The testing was conducted at Ontario Early Years Centres in Hamilton, Kitchener, Cambridge and Waterloo, as well as in various Kitchener day care centers that catered to children with demographic variables similar to the experimental groups (for the control condition). Children in the control group participated in various programs at the Ontario Early Years Centre, programs that may have included typical literacy instructional activities (circle time activities where children learn to talk about weather, the day of the year, sing and are read a book). For the experimental group, the testing was conducted at the Ontario Early Years Centre in Kitchener and Cambridge, as well as in various Kitchener day care centers that catered to children with demographic variables of interest.

Training program

The training program was designed as a readiness preschool program and was tailored to meet the needs of children that came from impoverished language environments. Teacher-led group activities alternated with free-group activities (see Appendix) where most of the children received some one-to-one instruction. Individual probes were conducted during free-group activities for the concepts taught in the previous and current sessions to determine individual achievement. Decisions regarding supplemental instruction for each child were made based on these data. The program consisted of metalinguistic exercise units, common vocabulary items (Scarborough, 2003) and sight words (Dolch words). It began with activities that promoted general listening skills through listening games that included verbal and non-verbal sounds.

Rhythm activities focused on beating (clapping, dancing, marching) the sentences in words and then the words, including children's names, in syllables. Syllables were counted in different activities (e.g. selecting toys to tidy up into three boxes, one each for one-, two- and three-syllable words; memory matching games with one-two and three-syllable words etc).

The next unit focused on identification of rhymes and non-rhymes (nursery rhymes; modified nursery rhymes where the rhyme was missing, e.g. the children were asked: "What is wrong with Jack and Jill /Went up the mountain?"). Games requiring rhyming judgments and rhyme production (e.g. "what rhymes with 'spoon'?") concluded the section on rhymes.

Phonemes were introduced next, with attention given to initial sounds of words. The sounds were introduced in relation with their corresponding letter, as instruction in phonological awareness coupled with the alphabetic principle was found to lead to significant gains in reading outcomes (Bradley & Bryant, 1985). Children learnt that new words resulted when the initial phoneme was omitted or a new initial phoneme was added to the existing word. Phoneme blending games ended the section of phoneme awareness training.

Vocabulary items were taught through incidental teaching of other skills (e.g. "put the P on top of the Bingo board") and different games (lotto, "I Spy", "Snails and Ladders", modified). The Dolch sight words were taught through a series of memory games, and puzzles. Upon teaching a group of sounds, the children were introduced to reading books with phonetic words containing only those sounds. For detailed session plans see Appendix 3 and 4. A checklist was used each session to assess children's skills when performing in the group and individually.

Results

Means and standard deviations for the participants were reported for all the measures. The sample was divided in three ways: a) the control group and the training group; b) the native English speaking group and the ESL group; and c) the low socio-economic status (SES) and the

middle SES group. Then means and standard deviations for the control and training groups by language status (LS) and SES were reported for all measures. A repeated measures analysis of variance was conducted for each of the measure to examine differences between pretest and posttest scores between the control and the training groups. Woodcock Word Identification, Woodcock Word Attack and Gruffalo scores were not introduced in this analysis as the vast majority of children were at the floor level on these measures. Regression analyses were conducted to examine whether phonological awareness, letter-sound knowledge, vocabulary, non-verbal intelligence, verbal short-term memory and processing speed (picture naming speed) predicted performance on phonetic Dolch word reading. A separate regression was conducted to examine whether vocabulary, phonological learning, verbal short-term memory or picture naming speed predicted phonological awareness.

Analyses of the Parent Home Questionnaire were performed for the answers relevant to the socio-economic status and value of literacy. A few of the questions from the Parent Home Questionnaire were of particular interest for the current study. One of them was "Knowing how to read is very important". All of the parents that participated in the study circled "True" for this question.

Another question was "Do you have more than 25 books at home?" The answers to this question were correlated with the SES level of the family, as defined by the educational level attained by the two parents living with the child.

An examination of the answers to the following questions: "What languages are spoken in your home?", "Which people speak these languages?" and "What language is spoken most frequently in your house?" revealed that all the ESL children spoke a language other than English at home and were exposed to adults speaking only their native language at home.

Examination of mean tables

Means and standard deviations for the control and the training groups were computed in order to reveal significant differences between these groups between their pretest and posttest scores. Table 4 presents these means and standard deviations for the control group and for the training group. The mean age for the groups was 45.8 months. There were no significant age differences between the control and the trained groups. Visual inspection of the means for all the measures but Picture Naming Speed, Vocabulary (PPVT) and Block Imitation (WPPSI-3), suggested that the control group outperformed the trained group on pretest. For Picture Naming Speed, children had to name all the objects from the test sheet as fast as possible; thus, low scores are associated with good performance on this measure. On posttest, however, the trained group outperformed the control group on all the measures, but Picture Naming Speed. Further analysis of group differences by language status (English versus ESL) and by SES (low versus middle) were performed.

Means and standard deviations for the pretest and posttest scores of the participants by language status were examined in order to demonstrate significant main effects of language status. Table 5 displays these means and standard deviations for each measure, for all the participants by language status. The two language status groups considered were English and English as-a-second language (ESL). Visual inspection of the means for all the measures on pretest, but for Block Imitation (WPPSI-3), name recognition and pseudoword repetition (CTOPP), suggested that the English speaking group had a better performance than the ESL group. On posttest, the English group continued to perform better than the ESL group on Sound Blending (WDRB), Vocabulary (PPVT), Scarborough Vocabulary Total and all the subtests of the Scarborough Vocabulary, Picture Naming Speed and Word Repetition. For the rest of the measures, the ESL group outperformed the English-speaking group.

In order to examine if differences existed between the pretest and the posttest scores of the participants grouped by their level of SES, means and standard deviations were computed for each measure, for all the participants by SES. Table 6 exhibits these means and standard deviations. The two SES groups were formed based on parents' educational status, taken from the Parent Home Questionnaire. Thus, middle SES children belonged to families in which both parents attained a university degree, and low SES children belonged to families where parents finished college or less. The ESL children had parents that mostly emigrated from countries where a university education is possible to attain.

On pretest, the low SES group appeared to have lower performance than the middle SES group on Syllable Deletion, Name Recognition, Word Repetition, Picture Naming Speed, Pseudoword Repetition (CTOPP) and Block Imitation (WPPSI-3). For the rest of the measures, the low SES group appeared to perform better than the middle SES group. On posttest, the low SES group continued to perform better than the middle SES group on all the vocabulary measures (PPVT, Scarborough) and Grammatical Knowledge (TACL). However, this result may be confounded by the mixed language status composition of the low SES group (English and ESL), whereas the middle SES group contained only ESL children. For the rest of the measures, the middle SES group outperformed the low SES group.

As a result of possible confounds related to LS and SES in this sample and due to the large differences on performance between a) pretest and posttest; b) the control and the training group; c) the native English speaking and ESL groups; and d) the low SES and the middle SES groups, repeated measures ANOVAs were conducted. The means and standard deviations for the control and training group by Time (pretest and posttest), by language status and by socio-economic status were computed (see Table 7). The test of equality of covariance matrices was reported for each measure as well. The results of this test showed that for three of the measures

the covariances were not equal across groups (phonetic Dolch word reading, Scarborough Space Relations Vocabulary and Scarborough Vocabulary total). Therefore, for those measures, significance levels and F values were reported without equal variances assumed. For the rest of the measures, the test of equality of covariance matrices showed non-significance: the measures had equal variances across the groups.

Table 4. Means and standard deviations for the control and training groups

		Control condition (N = 16) pretest	Control condition (N = 16) posttest	Training condition (N = 38) pretest	Training condition (N = 38) posttest
Phonetic Dolch word reading	Mean	.19	.19	.08	2.11
	SD	.403	.403	.273	2.99
Sight Dolch Word Reading	Mean	.00	.06	.00	.55
	SD	.00	.25	.00	1.06
Syllable deletion	Mean	2.88	3.56	2.82	5.74
	SD	3.50	3.31	3.64	3.47
Rime detection	Mean	4.94	3.75	4.18	7.79
	SD	2.29	2.93	3.39	3.32
Initial phoneme detection	Mean	5.38	3.69	4.03	6.37
	SD	2.71	2.72	2.98	2.83
Sound Blending (Woodcock)	Mean	6.63	7.69	6.45	11.32
	SD	4.08	4.08	5.26	4.52
Name recognition	Mean	.25	.25	.29	.82
	SD	.45	.45	.46	.39
Vocabulary (PPVT)	Mean	29.13	40.56	32.76	42.76
	SD	15.91	21.28	17.38	17.51
Space relations vocabulary (Scarborough)	Mean	9.94	10.44	6.92	10.47
	SD	7.71	8.76	6.95	7.46
Time/order relations vocabulary (Scarborough)	Mean	3.81	3.44	2.32	4.16
	SD	3.69	2.71	3.25	3.01
Quantity relations vocabulary (Scarborough)	Mean	6.56	5.13	4.55	6.16
	SD	3.74	3.28	3.35	2.85
Logic relations vocabulary (Scarborough)	Mean	3.88	3.63	3.21	4.76
	SD	2.42	2.22	2.35	1.88
Scarborough Vocabulary total	Mean	24.19	22.63	16.97	25.55
	SD	14.93	13.96	13.96	12.65

Table 4 (contd.) Means and standard deviations for the control and training groups

		Control condition (N = 16) pretest	Control condition (N = 16) posttest	Training condition (N = 38) pretest	Training condition (N = 38) posttest
Grammatical Knowledge (TACL)	Mean	12.25	12.31	9.55	12.84
	SD	6.19	7.96	6.99	7.20
Letter-Sound Identification	Mean	1.69	1.31	.92	11.24
	SD	6.49	4.99	2.84	8.36
Word Repetition	Mean	4.80	4.60	4.66	5.50
	SD	2.21	1.50	1.89	1.35
Picture Naming Speed (seconds)	Mean	75.18	64.75	72.16	63.91
	SD	43.39	25.16	36.00	30.66
Pseudoword Repetition (CTOPP)	Mean	7.44	7.31	7.08	8.89
	SD	2.76	2.41	2.58	3.13
Block Imitation (WPSSI-3)	Mean	6.40	9.56	8.05	12.32
	SD	3.98	6.10	7.04	7.57

Table 5. Means and standard deviations for the native English speaking and ESL groups

		English (N = 17) pretest	English (N = 17) posttest	ESL (N = 37) pretest	ESL (N = 37) posttest
Phonetic Dolch word reading	Mean	.12	.59	.11	1.97
	SD	.33	.79	.31	3.09
Sight Dolch Word Reading	Mean	.00	.18	.00	.51
	SD	.00	.53	.00	1.04
Syllable deletion	Mean	3.41	4.29	2.57	5.46
	SD	3.74	3.20	3.51	3.66
Rime detection	Mean	4.53	6.35	4.35	6.70
	SD	2.67	3.41	3.32	3.85
Initial phoneme detection	Mean	5.06	5.35	4.14	5.68
	SD	2.99	3.28	2.92	2.96
Sound Blending (Woodcock)	Mean	8.59	11.06	5.54	9.86
	SD	4.02	3.83	5.02	5.00

Table 5 (contd.) Means and standard deviations for the native English speaking and ESL groups

		English (N = 17) pretest	English (N = 17) posttest	ESL (N = 37) pretest	ESL (N = 37) posttest
Name recognition	Mean	.12	.53	.35	.70
	SD	.33	.51	.48	.46
Vocabulary (PPVT)	Mean	46.24	59.65	25.00	34.05
	SD	13.82	9.32	13.76	15.96
Space relations vocabulary (Scarborough)	Mean	14.35	18.47	4.81	6.78
	SD	6.85	4.21	5.20	6.08
Time/order relations vocabulary (Scarborough)	Mean	5.00	5.35	1.73	3.30
	SD	3.53	2.83	2.87	2.76
Quantity relations vocabulary (Scarborough)	Mean	7.29	8.00	4.16	4.86
	SD	2.71	1.66	3.50	2.96
Logic relations vocabulary (Scarborough)	Mean	4.76	5.35	2.78	4.00
	SD	2.19	1.80	2.20	2.01
Scarborough Vocabulary total	Mean	31.41	37.18	13.46	18.95
	SD	13.21	5.36	11.30	11.32
Grammatical Knowledge (TACL)	Mean	15.41	19.53	8.03	9.54
	SD	6.69	5.80	5.56	5.71
Letter-Sound Identification	Mean	1.94	6.41	.78	9.16
	SD	6.43	8.20	2.69	8.98
Word Repetition	Mean	5.47	5.53	4.33	5.11
	SD	1.01	1.07	2.20	1.56
Picture Naming Speed (seconds)	Mean	71.73	58.92	73.71	66.33
	SD	20.33	18.16	44.19	32.28
Pseudoword Repetition (CTOPP)	Mean	7.00	7.29	7.27	8.95
	SD	2.52	3.12	2.68	2.85
Block Imitation (WPSSI-3)	Mean	6.44	10.12	8.08	12.14
	SD	3.03	5.02	7.29	8.02

Table 6. Means and standard deviations for the low and middle SES groups

		Low SES (N = 28) pretest	Low SES (N = 28) posttest	Middle SES (N = 26) pretest	Middle SES (N = 26) posttest
Phonetic Dolch word reading	Mean	.14	.82	.08	2.31
	SD	.36	1.93	.27	3.13
Sight Dolch word reading	Mean	.00	.21	.00	.62
	SD	.00	.57	.00	1.17
Syllable deletion	Mean	2.54	4.36	3.15	5.88
	SD	3.58	3.41	3.60	3.56
Rime detection	Mean	4.57	6.32	4.23	6.88
	SD	3.12	3.45	3.14	3.97
Initial phoneme detection	Mean	4.64	5.32	4.19	5.85
	SD	3.13	3.01	2.77	3.10
Sound Blending (Woodcock)	Mean	6.79	10.07	6.19	10.42
	SD	5.05	4.32	4.82	5.09
Name recognition	Mean	.18	.61	.38	.69
	SD	.39	.50	.50	.47
Vocabulary (PPVT)	Mean	36.57	47.18	26.42	36.65
	SD	17.78	19.35	14.42	16.23
Space relations vocabulary (Scarborough)	Mean	10.39	13.43	5.04	7.27
	SD	7.85	8.01	5.40	6.21
Time/order relations vocabulary (Scarborough)	Mean	3.29	4.21	2.19	3.65
	SD	3.65	2.83	3.14	3.03
Quantity relations vocabulary (Scarborough)	Mean	6.11	6.50	4.12	5.15
	SD	3.44	2.74	3.47	3.15
Logic relations vocabulary (Scarborough)	Mean	3.43	4.54	3.38	4.31
	SD	2.54	2.06	2.21	2.03
Scarborough Vocabulary total	Mean	23.18	26.68	14.73	20.38
	SD	15.64	12.99	11.96	11.76
Grammatical Knowledge (TACL)	Mean	12.29	14.64	8.27	10.58
	SD	7.01	8.02	6.08	6.04

Table 6 (contd.) Means and standard deviations for the low and middle SES groups

		Low SES (N = 28) pretest	Low SES (N = 28) posttest	Middle SES (N = 26) pretest	Middle SES (N = 26) posttest
Letter-Sound Identification	Mean	1.18	6.50	1.12	10.23
	SD	5.04	7.88	3.17	9.39
Word Repetition	Mean	4.56	5.04	4.85	5.46
	SD	2.28	1.53	1.62	1.30
Picture Naming Speed (seconds)	Mean	79.86	68.29	66.03	59.37
	SD	41.05	34.63	33.87	19.99
Pseudoword Repetition (CTOPP)	Mean	6.39	7.29	8.04	9.65
	SD	2.60	2.90	2.39	2.65
Block Imitation (WPSSI-3)	Mean	6.33	9.82	8.88	13.31
	SD	3.34	4.83	8.26	8.80

Table 7. Means and Standard Deviations for the training and control groups by SES and LS on reading, oral language, phonological processing and verbal memory

		Control condition			Training condition			Equal covariance assumed
		English Low SES N = 6	ESL Low SES N = 3	ESL Middle SES N = 7	English Low SES N =11	ESL Low SES N = 8	ESL Middle SES N = 19	
Phonetic Dolch word reading	Mean	0.17	0.67	0.00	0.09	0.00	0.11	
(pretest)	SD	0.41	0.58	0.00	0.30	0.00	0.31	no
Phonetic Dolch word reading	Mean	0.00	0.33	0.29	0.91	1.50	3.05	
(posttest)	SD	0.00	0.58	0.49	0.83	3.46	3.37	
Sight Dolch Word Reading	Mean	.00	0.00	0.00	0.00	0.00	0.00	
(pretest)	SD	.00	0.00	0.00	0.00	0.00	0.00	N/A
Sight Dolch Word Reading	Mean	.00	.33	.00	0.27	0.25	.84	
(posttest)	SD	0.00	0.58	.00	0.65	0.71	1.30	
Syllable deletion (pretest)	Mean	3.33	.33	3.57	3.45	1.50	3.00	
	SD	3.67	0.58	3.91	3.96	3.50	3.57	yes
Syllable deletion (posttest)	Mean	3.67	0.67	4.71	4.64	5.88	6.32	
	SD	2.58	1.15	3.95	3.55	3.56	3.41	
Rime detection (pretest)	Mean	6.00	5.00	4.00	3.73	4.50	4.32	
	SD	2.10	2.00	2.45	2.69	4.47	3.41	yes
Rime detection (posttest)	Mean	4.50	4.67	2.71	7.36	6.88	8.42	
	SD	2.35	2.89	3.45	3.56	3.94	2.95	
Initial phoneme detection	Mean	6.67	6.67	3.71	4.18	3.00	4.37	
(pretest)	SD	1.03	2.52	3.10	3.37	3.20	2.71	yes
Initial phoneme detection	Mean	4.00	5.67	2.57	6.09	5.13	7.05	
(posttest)	SD	2.28	4.16	2.22	3.59	2.29	2.46	
Sound Blending (WDRB)	Mean	8.67	7.33	4.57	8.55	2.75	6.79	
(pretest)	SD	2.73	6.43	3.51	4.70	4.80	5.17	yes
Sound Blending (WDRB)	Mean	10.67	6.00	5.86	11.27	9.50	12.11	
(posttest)	SD	2.34	5.57	3.53	4.54	4.40	4.56	

Table 7 (contd.) Means and Standard Deviations for the training and control groups on reading, oral language, phonological processing and verbal memory

		Control condition			Training condition			Equal covariances assumed
		English Low SES N = 6	ESL Low SES N = 3	ESL Middle SES N = 7	English Low SES N =11	ESL Low SES N = 8	ESL Middle SES N = 19	
Name Recognition (pretest)	Mean	0.00	0.33	0.43	0.18	0.25	0.37	
	SD	0.00	0.58	0.53	0.41	0.46	0.50	yes
Name recognition (posttest)	Mean	0.17	0.33	0.29	0.73	0.88	0.84	
	SD	0.41	0.58	0.49	0.47	0.35	0.38	
Vocabulary (PPVT) (pretest)	Mean	41.33	25.33	20.29	48.91	20.25	28.68	
	SD	13.53	16.65	11.87	13.84	10.87	14.90	yes
Vocabulary (PPVT) (posttest)	Mean	61.33	30.00	27.29	58.73	27.13	40.11	
	SD	11.93	19.31	14.00	8.07	13.27	15.94	
Space relations vocabulary	Mean	17.33	5.67	5.43	12.73	3.75	4.89	
(Scarborough) (pretest)	SD	4.84	4.51	5.88	7.42	5.20	5.37	no
Space relations vocabulary	Mean	18.5	6.00	5.43	18.45	5.50	7.95	
(Scarborough) (posttest)	SD	4.13	7.21	7.48	4.46	5.88	5.76	
Time/order relations vocabulary	Mean	6.83	0.00	2.86	4.00	.88	1.95	
(Scarborough) (pretest)	SD	2.14	0.00	3.58	3.82	2.10	3.02	yes
Time/order relations vocabulary	Mean	3.83	3.33	3.14	6.18	2.13	3.84	
(Scarborough) (posttest)	SD	2.56	3.05	3.07	2.71	1.25	3.08	
Quantity relations vocabulary	Mean	9.00	6.00	4.71	6.36	3.63	3.89	
(Scarborough) (pretest)	SD	1.09	5.29	3.82	1.83	3.60	3.62	yes
Quantity relations vocabulary	Mean	7.17	4.00	3.86	8.45	4.2	5.3	
(Scarborough) (posttest)	SD	1.83	3.61	3.62	1.44	2.25	2.91	
Logic relations vocabulary	Mean	5.33	0.67	4.00	4.45	1.63	3.16	
(Scarborough) (pretest)	SD	1.75	0.58	2.16	2.42	1.60	2.24	yes
Logic relations vocabulary	Mean	5.17	2.33	2.86	5.45	3.63	4.84	
(Scarborough) (posttest)	SD	1.33	1.53	2.48	2.07	1.92	1.61	
Scarborough Vocabulary Total	Mean	38.5	12.33	17.00	27.55	9.75	13.89	
(pretest)	SD	5.75	8.96	12.94	14.69	10.05	11.83	no
Scarborough Vocabulary Total	Mean	34.67	15.67	15.29	38.55	15.5	22.26	
(posttest)	SD	3.72	12.34	13.88	5.77	9.75	10.68	

Table 7 (contd.) Means and Standard Deviations for the training and control groups on reading, oral language, phonological processing and verbal memory

		Control condition			Training condition			Equal covariances
		English Low SES N = 6	ESL Low SES N = 3	ESL Middle SES N = 7	English Low SES N = 11	ESL Low SES N = 8	ESL Middle SES N = 19	assumed
Letter- Sound Identification	Mean	4.33	0.00	0.14	0.64	0.00	1.47	
(pretest)	SD	10.61	0.00	0.38	2.11	0.00	3.66	no
Letter-Sound Identification	Mean	3.33	0.00	0.14	8.09	9.13	13.95	
(posttest)	SD	8.16	0.00	0.38	8.09	7.71	8.27	
Word repetition (pretest)	Mean	5.83	2.50	4.57	5.27	3.13	4.95	
	SD	0.75	3.54	2.44	1.10	3.09	1.27	no
Word repetition (posttest)	Mean	5.33	2.00	4.71	5.64	4.75	5.74	
	SD	0.52	2.83	0.95	1.29	1.39	1.33	
Picture Naming Speed (pretest)	Mean	68.53	119.72	61.8	73.47	82.53	67.59	
(seconds)	SD	25.83	68.03	36.94	17.83	60.56	33.6	no
Picture Naming Speed (posttest)	Mean	58.38	82.48	62.61	59.22	86.87	58.18	
(seconds)	SD	24.67	15.23	28.20	14.93	60.48	16.85	
Grammatical Knowledge (TACL)	Mean	14.83	10.67	10.71	15.73	6.25	7.37	
(pretest)	SD	5.84	2.08	7.43	7.36	4.40	5.45	yes
Grammatical Knowledge (TACL)	Mean	21.33	6.67	7.00	18.55	7.25	11.89	
(posttest)	SD	3.14	3.79	3.92	6.77	4.43	6.23	

The repeated measure analysis of variances

In order to compare children's pretest scores with their posttest scores, two repeated measures ANOVAs were conducted for the 38 trained children and 16 control children that completed pretests, intervention and posttests. The analyses were conducted to assess any differences between pretest and posttest and to identify differences between the training and the control group at each time point. Significance levels between $p = .10$ and $p = .05$ will be discussed due to the small sample size and in some cases to large effect sizes that are not significant at traditionally accepted significance levels, $p \leq .05$.

Thus, the repeated measures ANOVAs conducted were: 1) a 2 (training vs. control condition) x 2 (SES: low versus middle) mixed ANOVA for the ESL group and 2) a 2 (training vs. control condition) x 2 (language status: ESL, English as a first language) mixed ANOVA for the low SES group. The first repeated measures ANOVA analyzed the performance scores of the ESL group divided into a group of 27 trained children and a group of 10 control children. Therefore, the performance of the ESL children by SES in the control versus the training condition between pretest and posttest could be analyzed.

The second repeated measures ANOVA analyzed the performance scores of the low SES group divided by their control/training status into a group of 19 trained children and a group of 9 control children. Therefore, comparisons between the two different language status groups of low SES children, between pretest and posttest and between the control and the training groups could be analyzed. These two repeated measures ANOVAs are detailed below.

The repeated measures ANOVA for the ESL group. The 2 (training vs. control condition) x 2 (SES: low versus middle) mixed ANOVA for the ESL group was conducted on measures of phonological awareness skills (rhyme and initial phoneme detection, syllable, initial and final phoneme deletion and Sound Blending (WDRB)), oral-language skills (receptive vocabulary: PPVT; words commonly used in school: Scarborough and grammar: TACL), reading (Dolch phonetic words and Dolch sight words), verbal short term memory (non-word repetition, short list word repetition), processing speed (visual

Dolch sight words), verbal short term memory (non-word repetition, short list word repetition), processing speed (visual matching and picture naming speed), letter-sound knowledge, classroom pre-readiness skills (name recognition) and non-verbal reasoning. Between-subjects factors were training/control condition; and SES (low SES and middle SES). Time (pretest-posttest) served as a within-subjects factor and age was entered as a covariate.

For Dolch word reading (phonetic and sight words), Time-Order and Quantity relations vocabulary (Scarborough, 2003) and Pseudoword repetition (CTOPP, 1999), there was a significant main effect of time (see Table 8). For Rime detection, letter-sound identification and Word list repetition, there was a significant effect of training (see Table 9). Moreover, these significant training effects yielded large effect sizes, as measured by Cohen's *d*: for Rime Detection, $d = 1.43$, for letter-sound recognition $d = 2.12$ and for Word list repetition $d = .84$. The effect of training approached significance on phonetic Dolch word reading, $F(1, 32) = 3.39$, $p = .075$, Syllable Deletion, $F(1, 32) = 3.26$, $p = .080$ and Sound Blending $F(1, 32) = 2.91$, $p = .097$ (see Table 9). These training effects approaching significance yielded large effect sizes, as measured by Cohen's *d*: for phonetic Dolch word reading $d = .94$ and for Sound Blending, $d = 1.27$. For Syllable Deletion, the effect of training approaching significance yielded a moderate effect size: $d = .74$.

Significant main effects of SES (low versus middle) were found for Logic relations vocabulary (Scarborough, 2003), word list repetition, picture naming speed and pseudoword repetition (CTOPP, 1999). The main effect of SES approached significance on Syllable deletion, $F(1, 32) = 3.66$, $p = .065$ (see Table 9).

However, the main effects for all the measures but Dolch word reading and vocabulary (PPVT-III) were qualified by significant two-way interactions, and three of the measures were qualified by significant three-way interactions. Specifically, there were significant two- and three-way interactions for the following within-subject effects: Time x Training for all the measures but Dolch sight word reading, vocabulary (PPVT-III), Time-Order relations vocabulary (Scarborough, 2003), word list repetition,

approached significance on Syllable deletion, $F(1, 32) = 3.02$, $p = .092$, Space relations vocabulary (Scarborough, 2003), $F(1, 32) = 3.32$, $p = .077$ and on Final Phoneme Deletion, $F(1, 32) = 3.23$, $p = .082$. A Time x SES significant interaction was found for Logic relations vocabulary, $F(1, 32) = 5.10$, $p = .031$. A significant Time x Training x SES interaction was found for Time order relations vocabulary (Scarborough, 2003), $F(1, 32) = 5.36$, $p = .027$. This Time x Training x SES interaction approached significance for Scarborough vocabulary total, $F(1, 32) = 3.31$, $p = .078$, and for Scarborough Logic relations vocabulary, $F(1, 32) = 3.01$, $p = .092$ (Table 8). There was also a significant between-subjects interaction: a significant Training x SES interaction for initial phoneme detection, $F(1, 32) = 7.08$, $p = .012$ (Table 9). The most salient interactions were graphed (see Figures 1-10) and are analyzed in greater detail below.

The inspection of the Time x Training interaction graphs for the phonetic Dolch word reading, (significant), Syllable Deletion (approaching significance at $p = .092$), Sound Blending (Woodcock, 1997) (significant), and Letter-Sound Identification (significant), Final Phoneme Deletion (approaching significance at $p = .082$), reveals no significant difference in pretest scores between the training and control groups (Figures 1-5). However, the control group shows a flat slope from pretest to posttest. In contrast, the training group shows a steep positive slope from pretest to posttest and a significant difference from the control group on posttest scores.

The inspection of the Time x Training interaction graphs for Name Recognition (significant), Rime Detection (significant), Initial Phoneme Detection (significant) and Scarborough Vocabulary Total (significant), shows that the control group significantly outperforms the training group in pretest. However, while the control group shows a flat slope from pretest to posttest, or a very mild negative slope from pretest to posttest (Initial Phoneme Detection), the training group displays a steep positive slope from pretest to posttest, outperforming the control group on posttest scores (Figures 6-9).

The examination of the Time x Training x SES interaction for Scarborough Vocabulary Total (approaching significance at $p = .078$; see Figure 10) shows that there is a significant difference between

the low SES and middle SES control groups and the training groups on pretest and posttest scores, such that both the control groups outperform the trained groups in pretest. However, on posttest, the trained group outperforms the control group, for the middle SES group, or reaches the performance of the control group, for the low SES group. While the low SES control group has a mildly positive slope from pretest to posttest, the middle SES control group has a mildly negative slope from pretest to posttest. Additionally, both the low SES and the middle SES trained groups show a positive slope from pretest to posttest, with the middle SES group displaying a steeper slope than the low SES group.

The pretest-posttest results for Initial Phoneme Deletion, as well as for Word Identification (WRMT-R), Word Attack (WRMT-R) and Gruffalo, for the control and the trained groups, show that children performed at floor level in all these conditions. Therefore, these scores were not introduced in the Repeated Analysis of Variance for the ESL group.

Table 8. Tests of Within-Subjects Effects for the ESL group

	Time	Time*age	Time*T	Time*SES	Time*T*SES
Phonetic Dolch word reading	$F(1,32) = 4.92$ $p = .034$	$F(1,32) = 6.03$ $p = .020$	$F(1,32) = 5.28$ $p = .028$		
Sight Dolch Word Reading	$F(1,32) = 5.79$ $p = .020$	$F(1,32) = 4.88$ $p = .012$			
Syllable deletion			$F(1,32) = 3.02$ $p = .092$		
Rime detection			$F(1,32) = 6.27$ $p = .018$		
Initial phoneme detection			$F(1,32) = 4.88$ $p = .034$		
Sound Blending (Woodcock, 1997)			$F(1,32) = 9.06$ $p = .005$		
Name recognition			$F(1,32) = 10.47$ $p = .003$		
Vocabulary (PPVT)					
Space relations vocabulary		$F(1,32) = 3.08$ $p = .089$	$F(1,32) = 3.32$ $p = .077$		
Time-order relations vocabulary	$F(1,32) = 3.21$ $p = .083$				$F(1,32) = 5.36$ $p = .027$
Quantity relations vocabulary	$F(1,32) = 4.93$ $p = .034$	$F(1,32) = 5.12$ $p = .031$	$F(1,32) = 5.15$ $p = .030$		
Logic relations vocabulary			$F(1,32) = 5.20$ $p = .029$	$F(1,32) = 5.10$ $p = .031$	$F(1,32) = 3.01$ $p = .092$
Scarborough vocabulary total			$F(1,32) = 7.69$ $p = .009$		$F(1,32) = 3.31$ $p = .078$
Grammatical Knowledge (TACL)			$F(1,32) = 8.45$ $p = .007$		
Letter-Sound identification			$F(1,32) = 15.87$ $p < .001$		
Word list repetition					
Picture naming speed					
Final Phoneme Deletion			$F(1,32) = 3.23$ $p = .082$		
Pseudoword repetition (CTOPP)	$F(1,32) = 5.39$ $p = .027$	$F(1,32) = 4.52$ $p = .041$			

T = training; LS = language status; SES = socio-economic status.

Table 9. Tests of Between-Subjects Effects for the ESL group

	Age	Training	SES	T*SES
Phonetic Dolch word reading	$F(1,32) = 6.98$ $p = .013$	$F(1,32) = 3.39$ $p = .075$		
Sight Dolch Word Reading	$F(1,32)=6.88$ $p = .012$			
Syllable deletion		$F(1, 32)=3.26$ $p = .080$	$F(1,32) = 3.66$ $p = .065$	
Rime detection	$F(1,32)=4.37$ $p = .044$	$F(1,32)=4.38$ $p = .045$		
Initial phoneme detection	$F(1,32) = 5.41$ $p = .026$			$F(1,32) = 7.08$ $p = .012$
Sound Blending (Woodcock)	$F(1,32) = 10.83$ $p = .002$	$F(1,32) = 2.91$ $p = .097$		
Name recognition				
Space relations vocabulary Time-order Relations Vocabulary				
Quantity relations vocabulary				
Logic relations vocabulary	$F(1,32) = 3.32$ $p = .078$		$F(1,32) = 4.90$ $p = .034$	
Vocabulary (PPVT) Scarborough vocabulary total				
Grammatical Knowledge (TACL)				
Letter-Sound identification		$F(1,47) = 13.11$ p = .001		
Word list repetition	$F(1,32) = 11.19$ $p = .002$	$F(1,32) = 7.01$ $p = .013$	$F(1,32) = 10.71$ $p = .003$	
Picture naming speed			$F(1,32) = 6.17$ $p = .019$	
Final Phoneme Deletion	$F(1,32) = 6.29$ $p = .017$	$F(1,32) = 3,30$ $p = .078$		
Pseudoword repetition (CTOPP)			$F(1,32) = 9.21$ $p = .005$	

T = training; LS = language status; SES = socio-economic status.

Figure 1. Estimated Marginal Means for Phonetic Dolch word reading, Time x Training (p = .020)

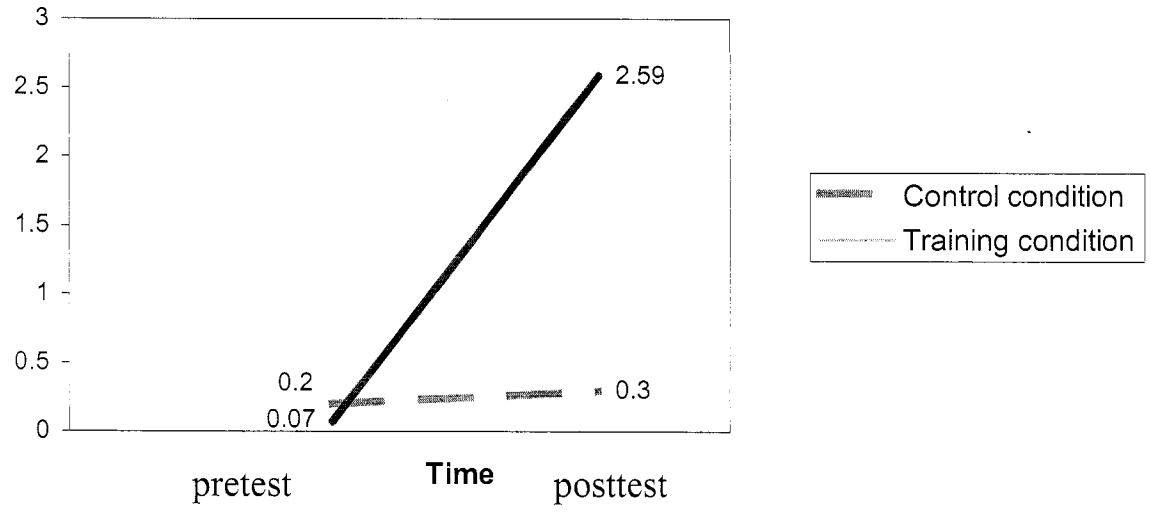


Figure 2. Estimated Marginal Means for Syllable Deletion, Time x Training (p = .092)

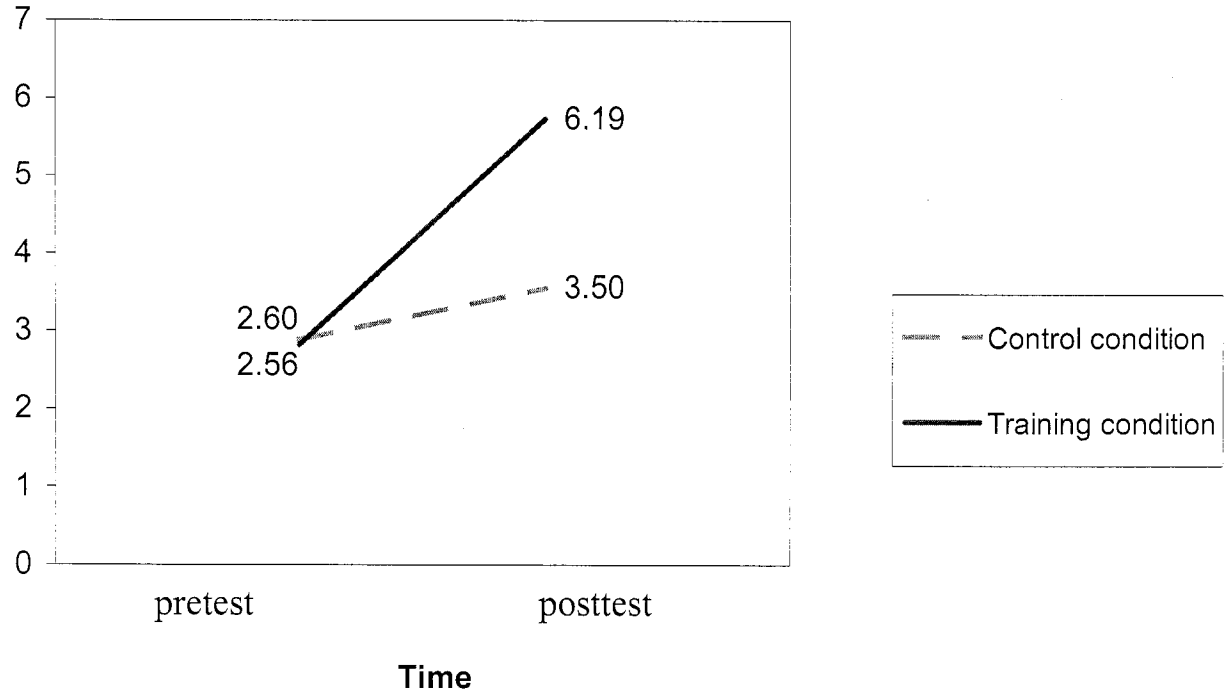


Figure 3. Estimated Marginal Means for Sound Blending (Woodcock, 1997), Time x Training (p = .005)

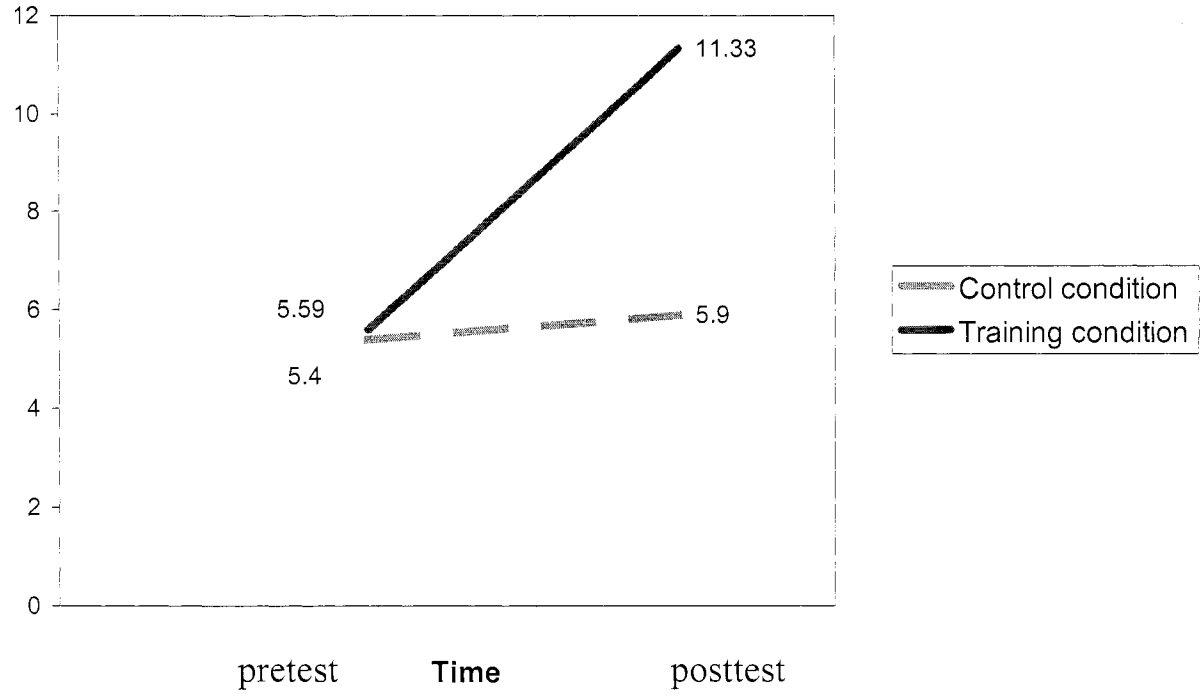


Figure 4. Estimated Marginal Means for Letter-Sound Identification, Time x Training ($p < .001$)

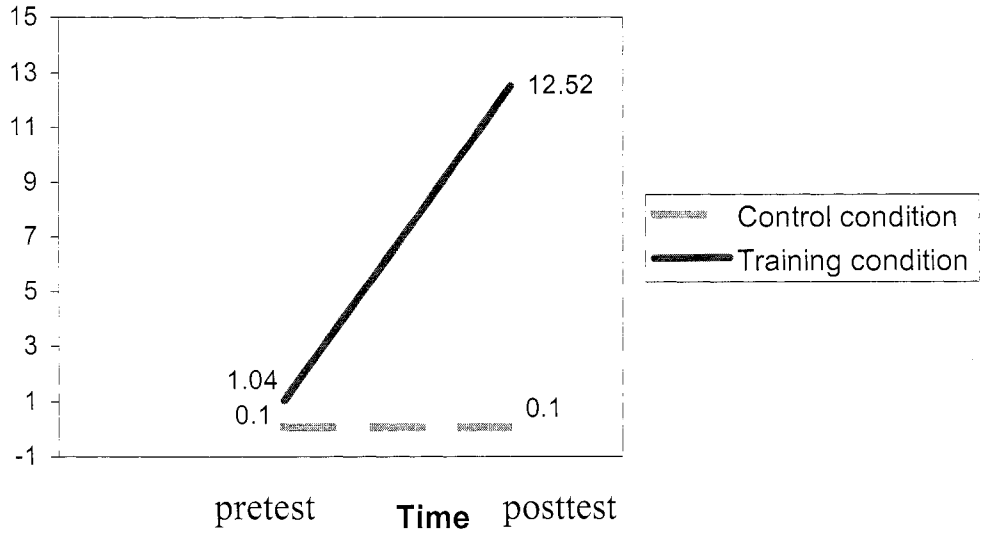


Figure 5. Estimated Marginal Means for Final Phoneme deletion, Time x Training (p = .082)

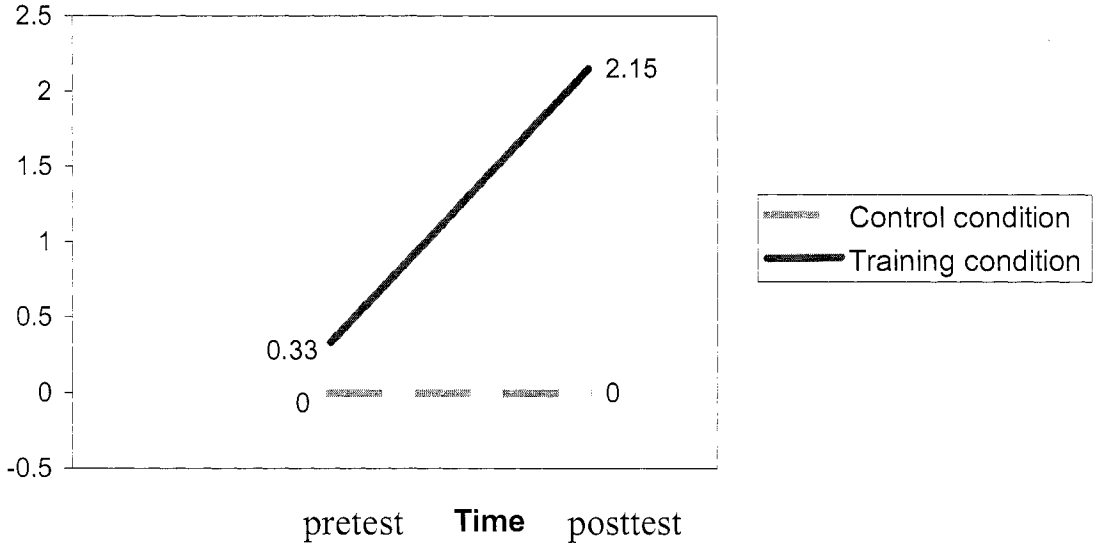


Figure 6. Estimated Marginal Means for Name Recognition, Time x Training (p = .003)

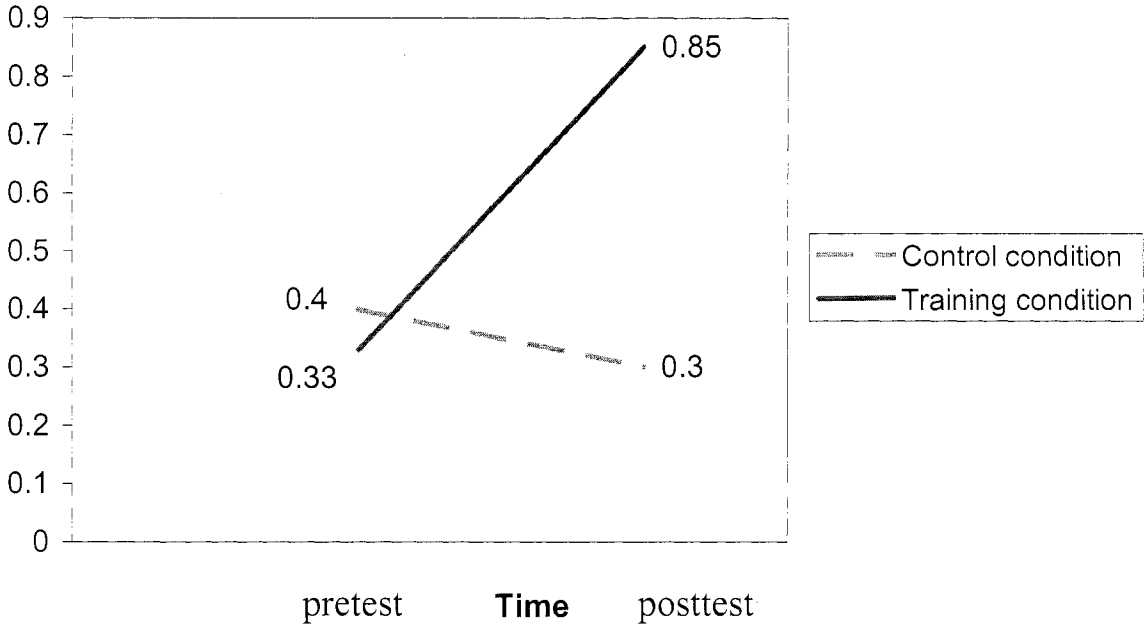


Figure 7. Estimated Marginal Means for Rime Detection, Time x Training ($p < .001$)

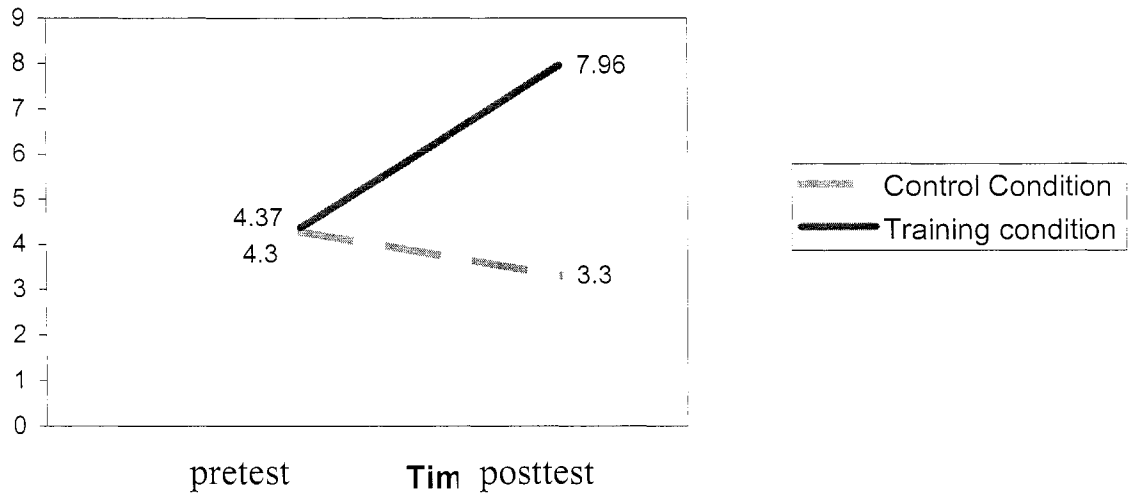


Figure 8. Estimated Marginal Means for Initial Phoneme Detection, Time x Training ($p = .034$)

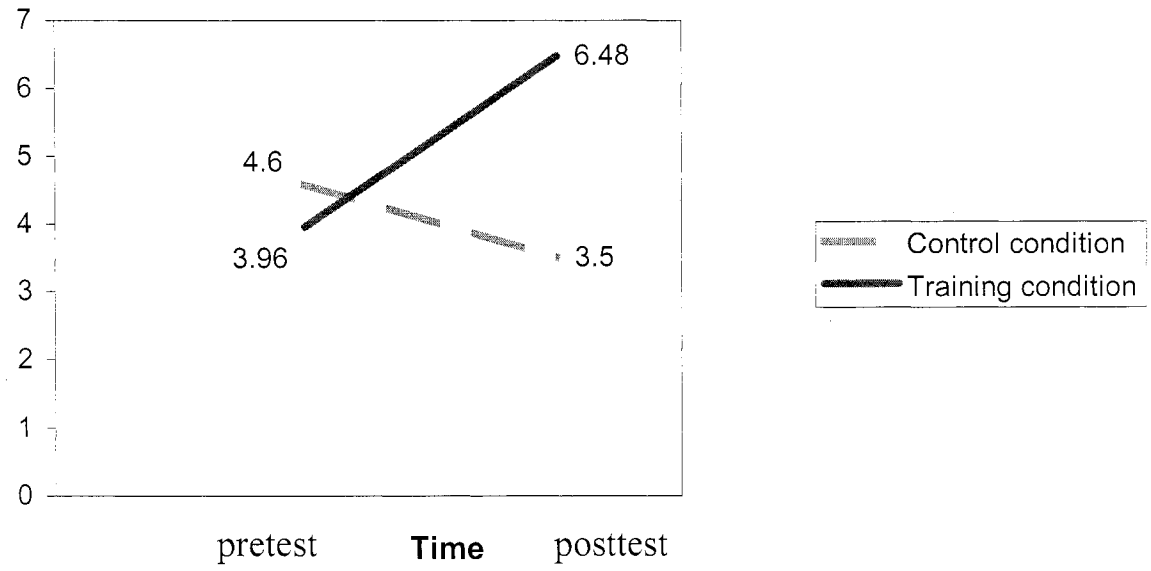


Figure 9. Estimated Marginal Means for Scarborough Vocabulary Total, Time x Training (p = .009)

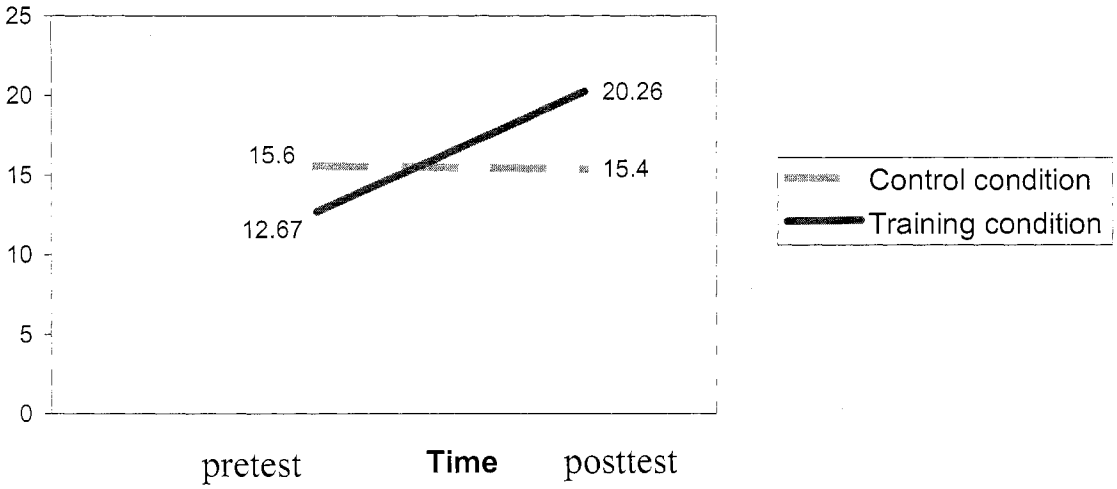
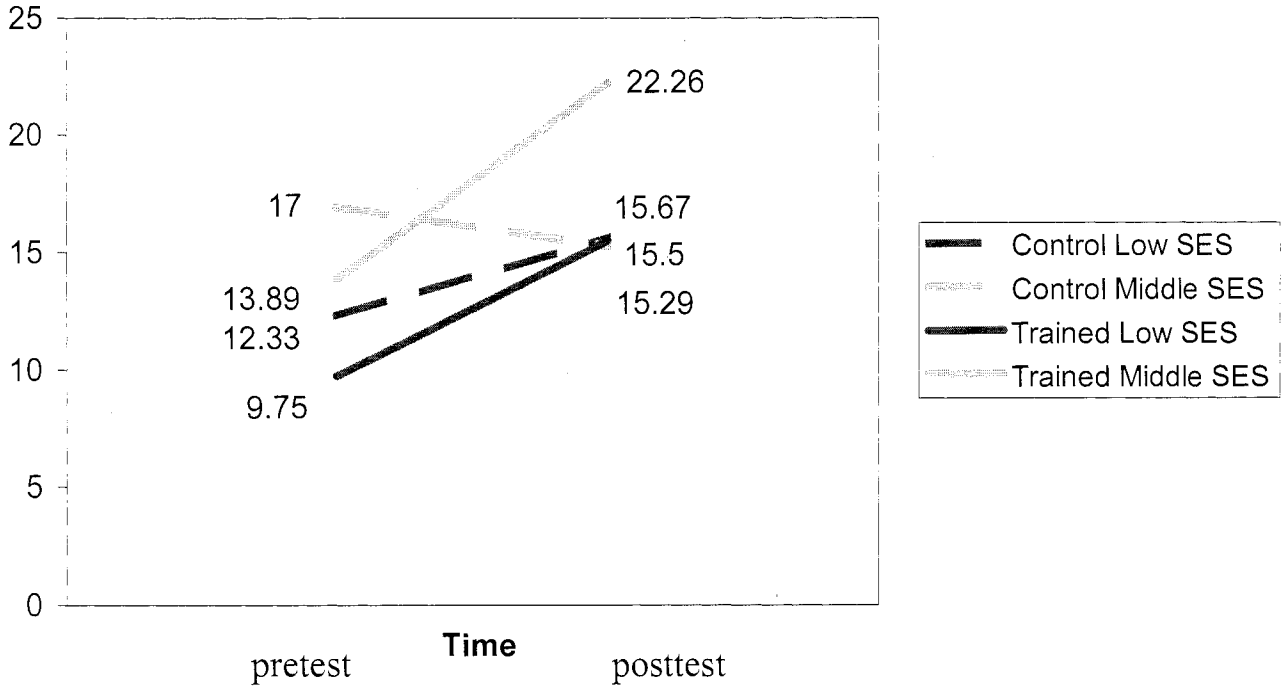


Figure 10. Estimated Marginal Means for Scarborough Vocabulary Total, Time x Training x SES (p = .078)



The repeated measures ANOVA for the low SES group. The2 (time: pretest vs. posttest) x 2 (training vs. control condition) x 2 (language status: ESL, English as a first language) mixed ANOVA for the low SES group was conducted on measures of phonological awareness skills (rhyme and initial phoneme detection, syllable, initial and final phoneme deletion and Sound Blending (WDRB, 1997)), oral-language skills (receptive vocabulary: PPVT-III; words commonly used in school: Scarborough and grammar: TACL-3), reading (Dolch phonetic words and Dolch sight words), verbal short term memory (non-word repetition, short list word repetition), processing speed (visual matching and picture naming speed), letter-sound knowledge, classroom pre-readiness skills (name recognition) and non-verbal reasoning. Between-subjects factors were training/control condition and language status (English versus ESL). Time (pretest-posttest) served as a within-subjects factor and age was entered as a covariate.

For Vocabulary (PPVT-III), Scarborough Space Relations Vocabulary and Scarborough Vocabulary Total, there was a significant main effect of time (see Table 10). For Syllable Deletion, name recognition and Rime Detection, there were effects of training approaching significance (see Table 11). Significant main effects of language status (English versus ESL) were found for Sound Blending (WDRB), vocabulary measures (PPVT, Scarborough), Grammatical Knowledge (TACL-3), word list repetition and picture naming speed.

However, the main effects for all the measures but Dolch words reading, vocabulary (PPVT-3), some of the Scarborough Vocabulary subtests (Space Relations and Logic Relations), Final Phoneme Deletion and picture naming speed were qualified by significant two-way interactions, and three of the measures were qualified by significant three-way interactions. Specifically, there were significant two- and three-way interactions for the following within-subject effects: Time x Training Rime Detection, Initial Phoneme Detection, Sound Blending, Name Recognition, Scarborough Quantity Relations Vocabulary, Scarborough Vocabulary Total and Letter-Sound

Identification (table 10); a Time x Training effect approached significance on Syllable Deletion $F(1, 23) = 3.44$, $p = .076$. A Time x LS significant interaction was found for Grammatical Knowledge, $F(1, 23) = 7.90$, $p = .010$. A significant Time x Training x LS interaction was found for Sound Blending, $F(1, 23) = 4.45$, $p = .046$, Scarborough vocabulary total, $F(1, 23) = 7.05$, $p = .014$, and for Scarborough Time Order Relations, $F(1, 23) = 10.75$, $p = .003$.

There were also between-subjects interactions: a significant Training x LS interaction for Syllable Deletion, $F(1, 23) = 4.42$, $p = .047$, and a Training x LS interaction approaching significance for word list repetition, $F(1, 23) = 3.95$, $p = .059$ (Table 11). The most salient interactions were graphed (see Figures 11-20) and are analyzed in greater detail below.

The inspection of the Time x Training interaction graphs for the Name Recognition (significant) and Syllable Deletion (approaching significance at $p = .076$, reveals no significant difference in pretest scores between the training and control groups (Figures 11 and 12). However, the control group shows a mildly positive slope from pretest to posttest. In contrast, the training group shows a steep positive slope from pretest to posttest and a significant difference from the control group on posttest scores.

The inspection of the Time x Training interaction graphs for Sound Blending (significant) and Letter-Sound Identification (significant), shows that the control group significantly outperforms the training group on pretest. However, while the control group shows a very mild positive slope from pretest to posttest (Sound Blending), or a very mild negative slope from pretest to posttest (Letter-Sound Identification), the training group displays a steep positive slope from pretest to posttest, outperforming the control group on posttest scores (Figures 13 and 14).

The inspection of the Time x Training significant interaction for Scarborough Vocabulary Total (Figure 15) shows that the control group significantly outperformed the training group on pretest. However, on posttest, the training group reaches the performance of the control group, with

both the control and the training group demonstrating a positive slope from pretest to posttest. The visual inspection shows that the training group displays a steeper slope from pretest to posttest than the control group.

The inspection of the Time x LS (Language Status) significant interaction for Syllable Deletion (Figure16) reveals that the English group largely outperforms the ESL group on pretest scores. Additionally, while the English group shows a mildly positive slope from pretest to posttest, the ESL group shows a steep positive slope from pretest to posttest. Therefore, the initial difference in pretest scores between the English and the ESL group is reversed for the posttest scores, with the ESL group outperforming the English group on posttest.

The inspection of the Time x LS (Language Status) significant interaction for Grammatical Knowledge (TACL-3) (Figure17) reveals that the English group outperforms the ESL group on pretest scores. Additionally, while the ESL group shows a flat slope from pretest to posttest, the English group shows a positive slope from pretest to posttest. Therefore, the initial difference in pretest scores between the English and the ESL group is significantly increased in posttest scores, with the English group continuing to outperform the ESL group.

The inspection of the Training x LS significant interaction for Word Repetition (Figure 18) shows that the English control group significantly outperforms the ESL control group. However, the ESL trained group shows a steep positive slope from pretest to posttest, increasing significantly the number of words repeated as an effect of training. In contrast, the English trained group repeats fewer words than the English control group.

The examination of the Time x Training x LS significant interaction for Scarborough Vocabulary Total (Figure 19) shows that there is a significant difference between the English and ESL control groups on pretest and posttest scores, such that the English group outperforms the ESL group at both time points. Additionally, the English control group does not show any growth from

pretest to posttest (mildly negative slope from pretest to posttest), while the ESL control group shows a mildly positive slope from pretest to posttest. The same significant difference between the English and the ESL trained groups is shown on pretest scores and posttest scores, with the English group outperforming the ESL group. However, both the English and the ESL trained group show growth from pretest scores to posttest scores on Scarborough vocabulary. The slope between pretest and posttest scores is steeper for the English trained group than for the ESL trained group.

The inspection of the Time x Training x LS significant interaction for Sound Blending (WDRB, 1997) reveals a difference between the English and the ESL control groups both on pretest and on posttest measures (see Figure 20). In addition, the English control group shows growth from pretest to posttest, while the ESL group shows a mildly negative slope from pretest to posttest. The difference between the English and the ESL trained groups is large on pretest scores. However, the ESL trained group reaches the performance of the English trained group on posttest. Additionally, the ESL group shows a steeper slope from pretest to posttest as an effect of training than the English group.

The pretest-posttest results for Initial Phoneme Deletion, as well as for Word Identification (WRMT-R), Word Attack (WRMT-R) and Gruffalo, for the control and the trained groups show that children performed at floor level in all these conditions. Therefore, these scores were not introduced in the Repeated Analysis of Variance.

Table10. Tests of Within-Subjects Effects for the low SES group

	Time	Time*age	Time*T	Time*LS	Time*T*LS
Phonetic Dolch word reading					
Sight Dolch Word Reading					
Syllable deletion			$F(1,23) = 3.44$ $p = .076$		
Rime detection			$F(1,47)=17.36$ $p < .001$		
Initial phoneme detection			$F(1,23) = 6.46$ $p = .018$		
Sound Blending (Woodcock)			$F(1,23) = 6.60$ $p = .017$		$F(1,23) = 4.45$ $p = .046$
Name recognition			$F(1,23) = 5.92$ $p = .023$		
Vocabulary (PPVT)	$F(1,23) = 7.9.91$ $p = .004$	$F(1,23) = 7.91$ $p = .010$			
Space relations vocabulary	$F(1,23) = 6.59$ $p = .017$	$F(1,23) = 5.76$ $p = .025$			
Time-order relations vocabulary	$F(1,23) = 3.95$ $p = .059$			$F(1,23) = 5.05$ $p = .034$	$F(1,23) = 10.75$ $p = .003$
Quantity relations vocabulary			$F(1,23) = 8.73$ $p = .007$		
Logic relations vocabulary					
Scarborough vocabulary total	$F(1,23) = 6.64$ $p = .017$	$F(1,23) = 5.66$ $p = .026$	$F(1,23) = 5.94$ $p = .023$		$F(1,23) = 7.05$ $p = .014$
Grammatical Knowledge (TACL)	$F(1,23) = 3.91$ $p = .060$	$F(1,23) = 3.44$ $p = .076$		$F(1,23) = 7.90$ $p = .010$	
Letter-Sound Identification			$F(1,23) = 9.47$ $p = .005$		
Word list repetition					
Picture naming speed					
Final Phoneme Deletion					

T = training; LS = language status; SES = socio-economic status.

Table 11. Tests of Between-Subjects Effects for the low SES group

	Age	Training	LS	T*LS
Phonetic Dolch word reading				
Sight Dolch Word Reading				
Syllable deletion	$F(1,23) = 7.58$ $p = .011$	$F(1,23) = 3.33$ $p = .081$	$F(1,23) = 3.01$ $p = .096$	$F(1,23) = 4.42$ $p = .047$
Rime detection	F(1,47)=6.05 p = .018	F(1,47)=3.19 p = .081		
Initial phoneme detection Final Phoneme Deletion				
Sound Blending (Woodcock)	$F(1,23) = 4.70$ $p = .041$		$F(1,23) = 5.78$ $p = .025$	
Name recognition		$F(1,23) = 4.20$ $p = .052$		
Vocabulary (PPVT)			$F(1,23) = 36.35$ $p < .001$	
Space relations vocabulary			$F(1,23) = 32.16$ $p < .011$	
Time-order relations vocabulary	$F(1,23) = 5.60$ $p = .027$		F(1,47)=22.21 p < .001	
Quantity relations vocabulary			$F(1,23) = 14.09$ $p = .001$	
Logic relations vocabulary			$F(1,23) = 32.20$ $p < .001$	
Scarborough vocabulary total	$F(1,23) = 3.16$ $p = .088$		$F(1,23) = 38.36$ $p < .001$	
Grammatical Knowledge (TACL)			$F(1,23) = 20.86$ $p < .001$	
Letter-Sound Identification				
Word list repetition			$F(1,23) = 15.78$ $p = .001$	$F(1,23) = 3.95$ $p = .059$
Picture naming speed			$F(1,23) = 4.31$ $p = .050$	

T = training; LS = language status; SES = socio-economic status.

Figure 11. Estimated Marginal Means for Name Recognition, Time x Training (p = .023)

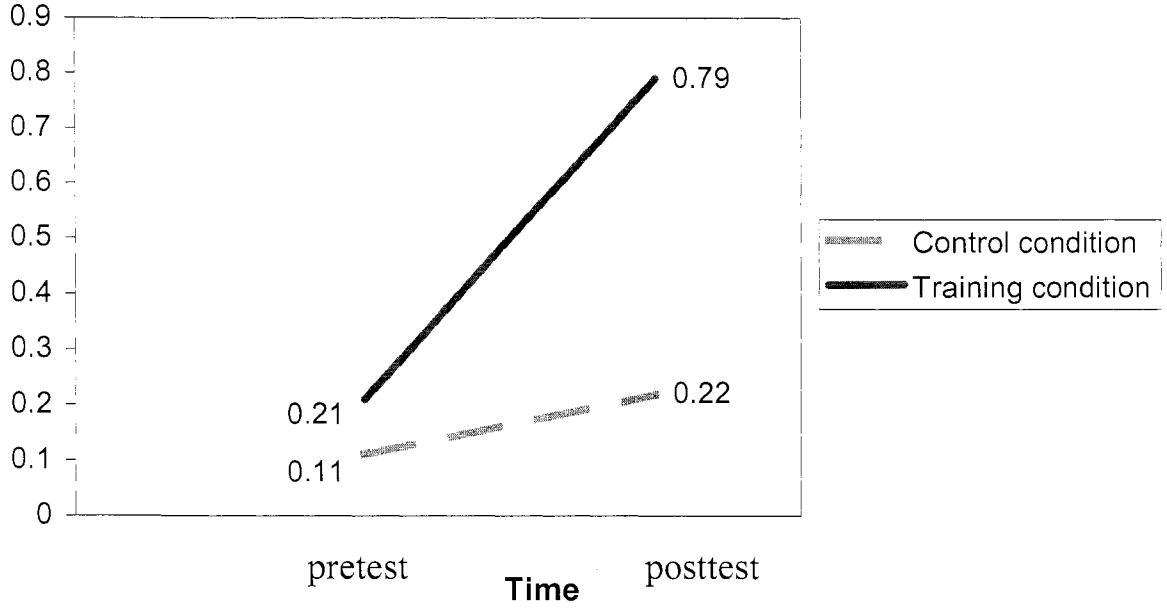


Figure 12. Estimated Marginal Means for Syllable Deletion, Time x Training (p = .076)

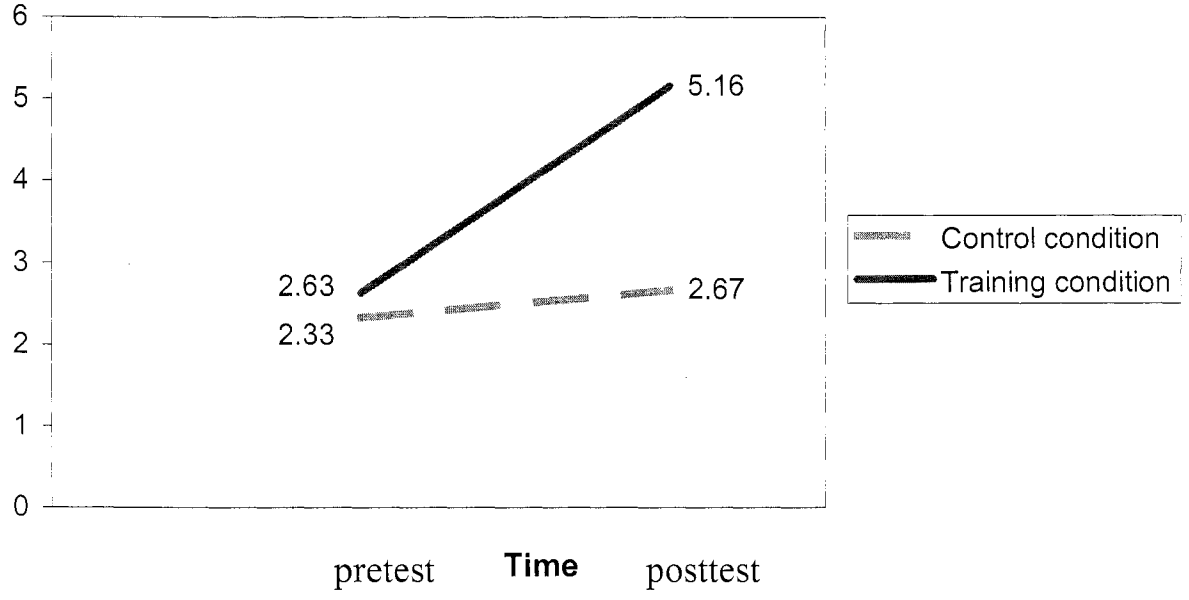


Figure 13. Estimated Marginal Means for Sound Blending (Woodcock, 1997), Time x Training (p = .017)

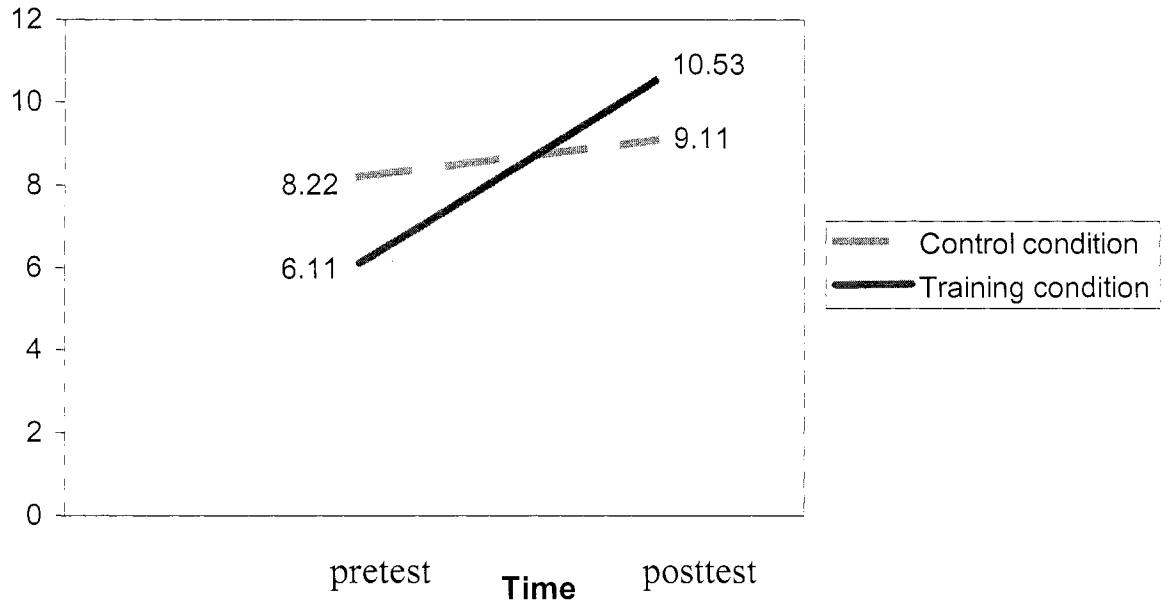


Figure 14. Estimated Marginal Means for Letter-Sound Identification, Time x Training (p = .005)

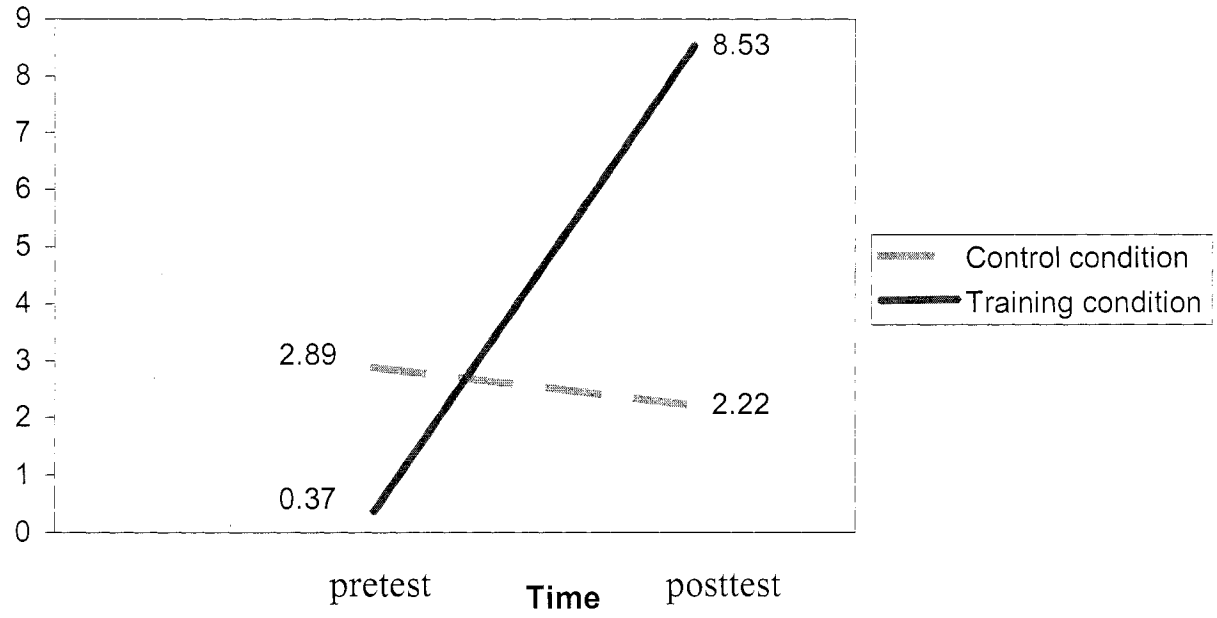


Figure 15. Estimated Marginal Means for Scarborough Vocabulary Total, Time x Training (p = .023)

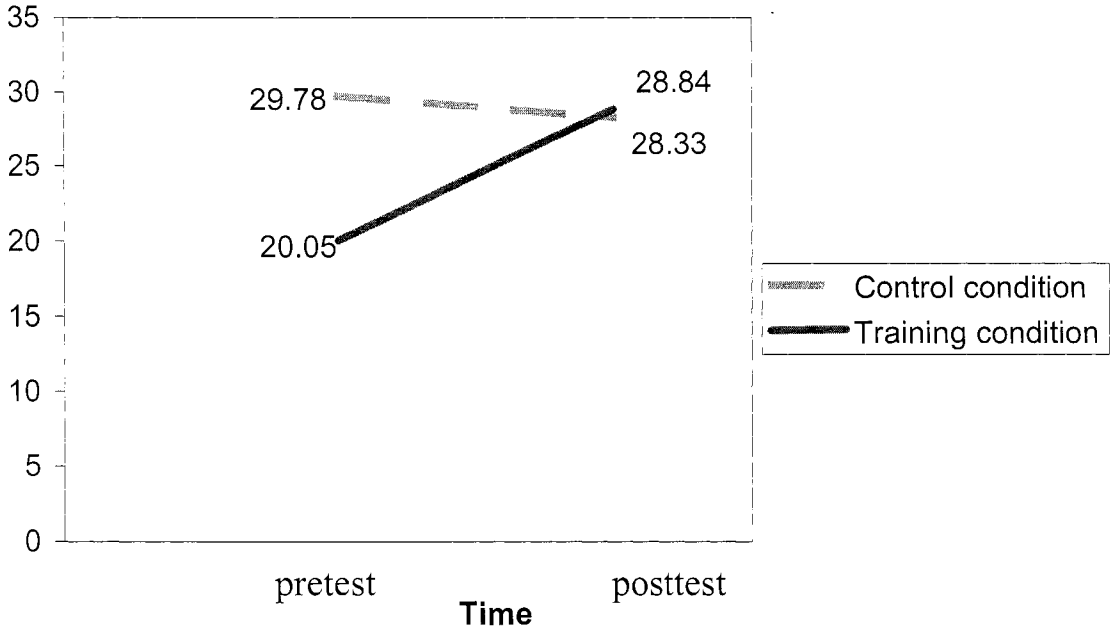


Figure 16. Estimated Marginal Means for Syllable Deletion, Training x LS (p = .047)

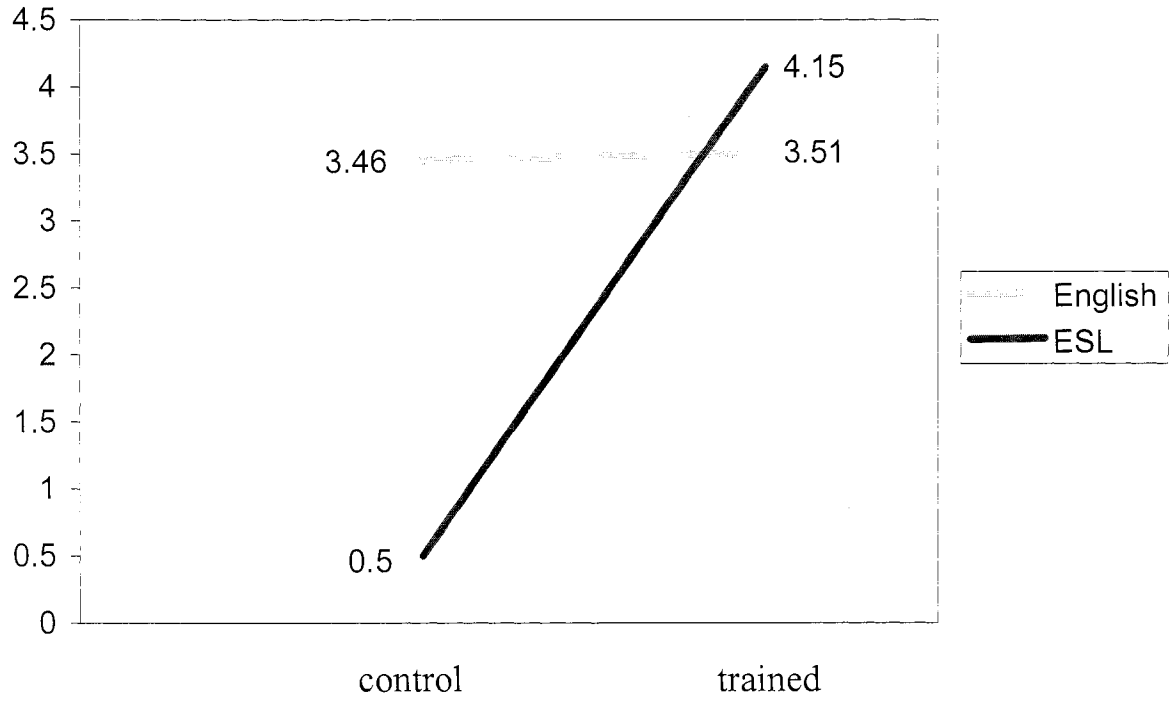


Figure 17. Estimated Marginal Means for Grammatical Knowledge (TACL-3) Time x LS (p = .011)

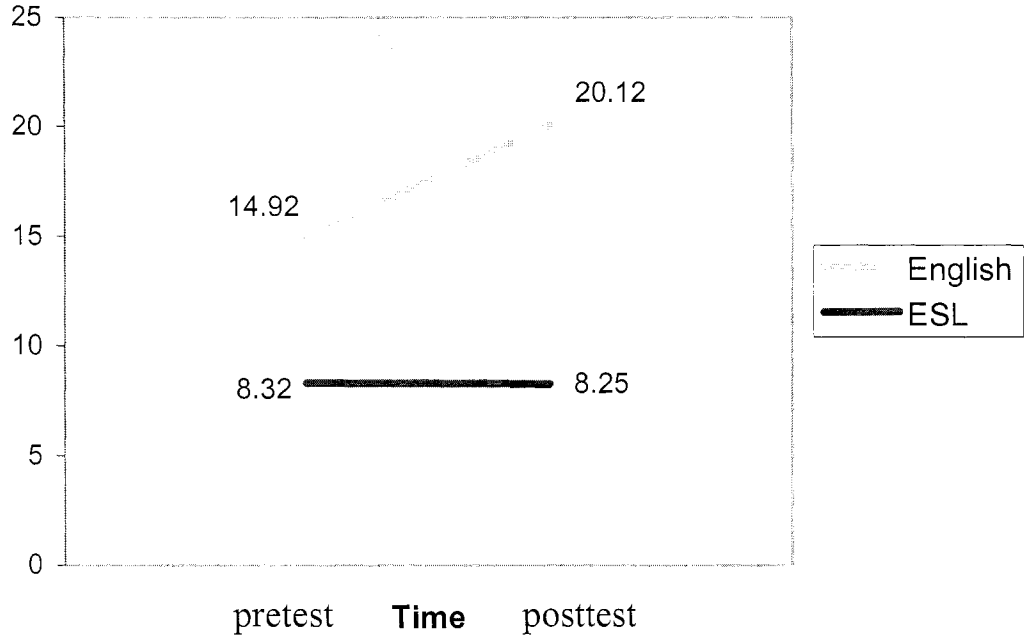


Figure 18. Estimated Marginal Means for Word Repetition, Training x LS (p = .059)

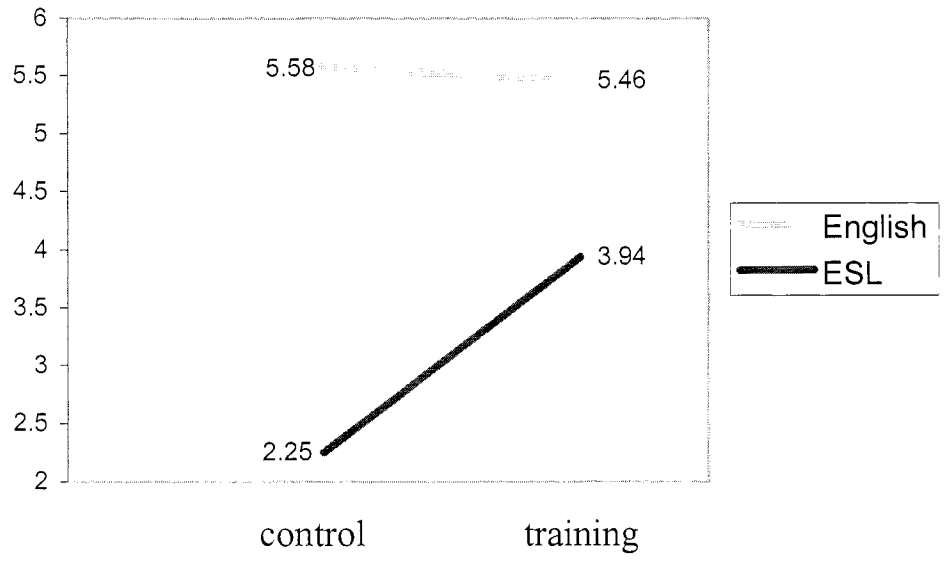


Figure 19. Estimated Marginal Means for Scarborough Vocabulary Total, Time x Training x LS (p = .021)

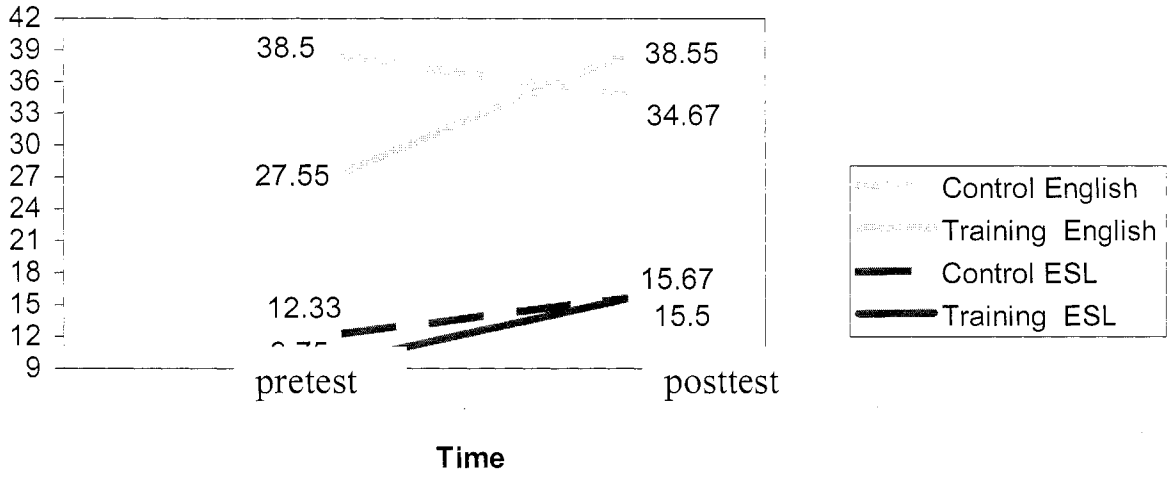
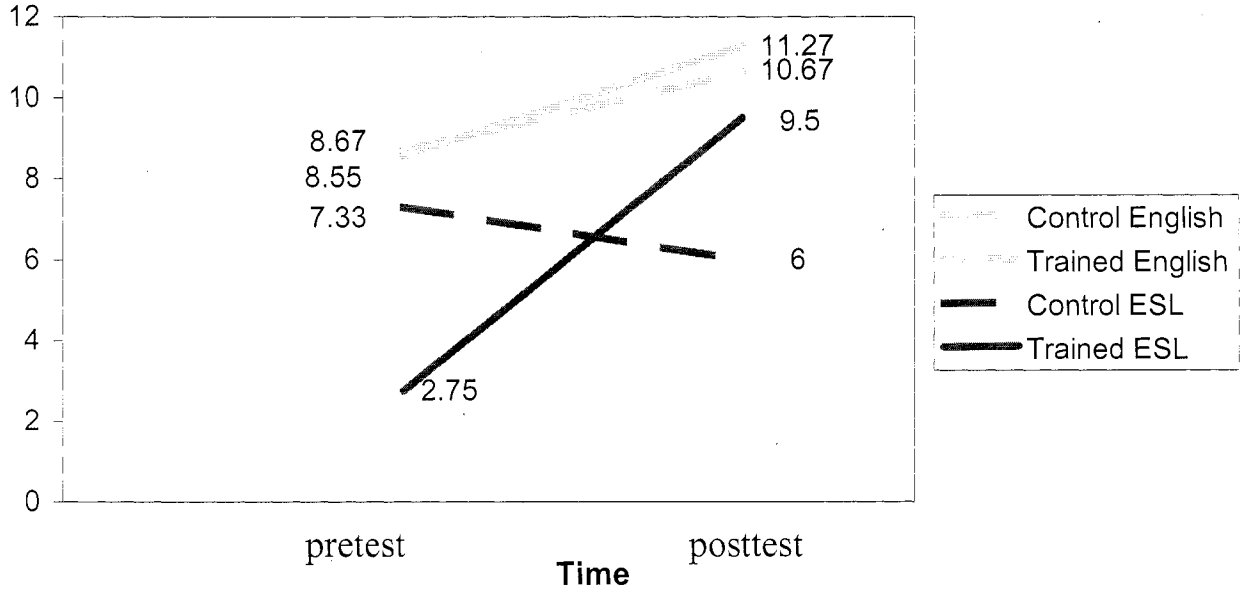


Figure 20. Estimated Marginal Means for Sound Blending (Woodcock, 1997), Time x Training x LS (p = .046).



Regression analyses

Zero-order correlations were calculated for posttest scores of the phonetic Dolch word reading, Syllable Deletion, Rime Detection, Phoneme Detection, Sound Blending (Woodcock), oral language (vocabulary PPVT), Letter-Sound Identification, verbal short-term memory, picture naming speed, pseudoword repetition (CTOPP) and non-verbal intelligence (Block Imitation). These correlations are displayed in Table 7. Performance on the Phonetic Dolch word reading test showed a moderate significant correlation with performance on Letter-Sound Identification, $r(54) = .615$, performance on Block Imitation (non-verbal intelligence), $r(54) = .55$, performance on Sound Blending (Woodcock), $r(54) = .54$ and performance on pseudoword repetition (CTOPP), $r(54) = .49$.

Zero-order correlations were then computed for the posttest scores on phonological awareness, vocabulary (PPVT), pseudoword repetition, verbal short-term memory (word repetition), non-verbal intelligence (Block Imitation, WPPSI-3), picture naming speed and letter-sound identification (see Table 9). The phonological awareness variable was obtained as a composite variable of rime detection, initial phoneme detection, syllable deletion and sound blending. The composite scores were obtained by adding the scores attained by each child on these measures. Phonological awareness was highly correlated with Letter-Sound Identification, $r(54) = .61$, with Block Imitation, $r(54) = .58$, with word repetition, $r(54) = .50$, and with pseudoword repetition (CTOPP), $r(54) = .47$.

Based on the results of the correlations, variables were selected for the regression analyses examining statistical predictors of posttest scores on the phonetic Dolch word reading list and the phonological awareness composite score. A preliminary multiple regression was conducted to examine whether Syllable Deletion, Rime Detection, Phoneme Detection, Sound Blending (WDRB), letter-sound knowledge, vocabulary, non-verbal intelligence, verbal short-term memory,

pseudoword repetition (CTOPP) and picture naming speed predicted performance on Phonetic Dolch word reading. As Syllable Deletion, Word Repetition (verbal short-term memory) and picture naming speed did not show high correlations with the reading measure, they were not entered in the regression analysis. A composite score for Rime Detection and Initial Phoneme Detection was calculated, as they both measure the same level of phonological awareness (onset rime) and in order to reduce the number of variables being entered into the regressions. These scores, renamed onset-rime detection in the analyses, were calculated by combining the raw scores obtained in posttest for each of the children, for the two variables. The model containing the composite onset-rime score, Sound Blending (Woodcock), vocabulary (PPVT), Letter-Sound Identification and Block Imitation accounted for 57.3 % of the variance in the performance of phonetic Dolch word reading. Letter-Sound Identification, Block Imitation, Sound Blending (WDRB) significantly predicted performance on the reading test (see Table 6). Vocabulary (PPVT) approached significance and the composite variable of Rime and Initial Phoneme Detection, as well as the pseudoword repetition (CTOPP) were not significant in the model. Table 8 summarizes the results of this regression analysis.

Separate multiple regression analyses were conducted based on these correlations, to examine whether vocabulary, verbal short-term memory (word repetition), pseudoword repetition (CTOPP), non-verbal intelligence (Block Imitation, WPPSI-3), letter-sound identification and picture naming speed predicted posttest phonological awareness scores based on the composite of the four measures. As picture-naming speed did not show a high correlation with phonological awareness, it was omitted from the regression analysis. The model containing vocabulary (PPVT), pseudoword repetition (CTOPP), Block Imitation, Letter-Sound Identification and Word Repetition was then tested. The model predicted 57.7% of the variance in phonological awareness. Block Imitation, Word Repetition and Letter-Sound Identification significantly predicted performance on the

phonological awareness (see Table 10). Vocabulary (PPVT) and pseudoword repetition (CTOPP) were not significant in the model.

Table 12. Correlations between posttest scores (1): phonetic Dolch word reading, Syllable Deletion, Rime Detection, Phoneme Detection, Sound Blending (Woodcock), oral language (vocabulary PPVT), Letter-Sound Identification, verbal short-term memory, picture naming speed and non-verbal intelligence (Block Imitation), Pseudoword Repetition (CTOPP).

	1	2	3	4	5	6	7	8	9	10.
1. Phonetic Dolch word reading										
2. Syllable Deletion	.311**									
3. Rime Detection	.292*	.521***								
4. Initial Phoneme Detection	.402***	.417***	.542 ***							
5. Sound Blending (WDRB)	.547***	.363**	.407***	.460***						
6. Vocabulary (PPVT)	.032	.110	.233*	.241*	.272*					
7. Letter-Sound Identification	.615***	.558***	.445***	.401***	.448***	.181				
8. Word Repetition	.224	.343**	.478***	.425***	.317**	.432***	.391**			
9. Picture Naming Speed	-.187	-.260*	-.241*	-.274*	-.130	-.446***	-.228*	-.270*		
10. Block Imitation (WPPSI-3)	.550***	.448***	.421***	.482***	.431***	.240*	.422***	.168	-.341**	
11. Pseudoword Repetition (CTOPP)	.492***				.403***	.142	.580***	.459***	-.215	.350**

p < .001, ***; p <.01, **; p <.05, *

Table 13. Regression analysis examining variables related to Phonetic Dolch word reading on posttest scores

Phonetic Dolch Word Reading Model				
		Beta	T (N = 54)	Significance
Total R^2	.573			
Vocabulary (PPVT)		-.184	-1.82	.075
Pseudoword Repetition (CTOPP)		.107	.89	.378
Block Imitation (WPSSI-3)		.318	2.73	.009
RimePhoneme (Composite)		-.080	-.64	.523
Letter-Sound Identification		.359	2.78	.008
Sound Blending (WDRB)		.296	2.49	.016

Table 14. Correlation between the posttest scores (2): phonological awareness, vocabulary (PPVT), pseudoword repetition (CTOPP), verbal short-term memory (word repetition), non-verbal intelligence (Block Imitation, WPPSI-3), picture naming speed and letter-sound identification

	1	2	3	4	5	6
1. Phonological Awareness						
2. Vocabulary (PPVT)	.281*					
3. Pseudoword Repetition (CTOPP)	.471***	.142				
4. Block Imitation (WPSSI-3)	.576***	.240*	.350**			
5. Letter-Sound Identification	.608***	.181	.580***	.422***		
6. Word Repetition	.504***	.432***	.459***	.168	.391**	
7.Picture Naming Speed	-.282*	-.446***	-.215	-.341**	-.228*	-.270*

$p < .001$, ***; $p < .01$, **; $p < .05$, *

Table 15. Regression analysis examining variables related to Phonological Awareness on posttest scores

Phonological Awareness Model		Beta	T (N = 54)	Significance
Total R^2	0.577			
Vocabulary (PPVT)		-0.006	-0.06	.953
Pseudoword Repetition (CTOPP)		.007	.058	.954
Block Imitation (WPSSI-3)		.388	3.62	.001
Letter-Sound Identification		.318	2.60	.012
Word Repetition		.313	2.65	.011

Discussion

The present study examined the effects of phonological awareness (PA) coupled with oral vocabulary and sight-word training in preschool children coming from diverse SES status and ESL versus non-ESL status. Specifically, it was hypothesized that all the children participating in the intervention would show significantly better performance in phonological awareness, trained and untrained vocabulary and sight word recognition than children in the control group. Also, children from low SES English-speaking and ESL families would show greater gains in English measures of skills related to reading proficiency than children coming from middle class ESL families. Therefore, the effects of training, the effects of language status and SES, the predictors of phonological awareness and reading performance and the educational implications of the current study are discussed in greater detail below.

Effects of training

Significant group differences were found for the ESL children across the control group and the training group on pretest scores and posttest scores for phonetic Dolch word reading, letter-sound identification and all the measures of phonological awareness except syllable deletion, initial phoneme and final phoneme deletion. Thus, the training group read significantly more phonetic words in posttest, and both groups performed at floor level on pretest. The same pattern was found for measures of phonological awareness, such as syllable deletion (approaching significance), rime detection, sound blending (Woodcock, 1997), as well as for letter-sound identification: the children in the training group showed significantly higher scores in posttest than in pretest than the children in the control group. In addition, there were no significant differences between groups on the above mentioned measures of reading and phonological awareness a) when the low socio-economic status (SES) English speaking children

were compared to the low SES English as-a-second language (ESL) children; b) or when the children from low SES ESL families were compared to children from middle SES ESL families. Only for Sound Blending (Woodcock, 1997), the ESL group showed a larger positive slope than the English group as the effect of training. For this task, the ESL scores on posttest almost reached those of the English group on posttest. This effect of training by language status between pretest and posttest was marginally significant for Sound Blending. For Syllable Deletion, the low SES ESL group outperformed the low SES English group on posttest scores, although the low SES English group demonstrated a higher performance than the low SES ESL group on pretest scores. It is also important to note that the ESL training group outperformed the ESL control group on phonetic Dolch words reading (approaching significance) and letter-sound identification (significant) (main effects).

The large effect size of training on these measures supports the findings of the National Reading Panel: the mean effect size on reading for training programs that made explicit links with letters as the sound symbols (d = .67) was larger than that for phonological awareness training alone (d = .38) (Bus & van IJzendoorn, 1999). In addition, the main effect of training on rime detection was significant and the main effects of training on Sound Blending (Woodcock, 1997), Syllable and Final Phoneme Deletion approached significance. These results, together with the results of the regression analysis on phonetic Dolch words reading, demonstrate that at least the first phase of reading, decoding, can be acquired based on phonological awareness and letter-sound identification skills, for the ESL group (low SES and middle SES). These results support the findings from other intervention studies, demonstrating that instruction in phonological awareness linked with instruction in the alphabetic principle (letter-sound

knowledge) is beneficial for reading acquisition for L2 learners (Aram & Biron, 2004; Bus & van IJzendoorn, 1999; Gerber et al., 2004).

No effect of training was found for Dolch word reading when low SES (English and ESL) children's performance was compared from pretest to posttest in the control and the training groups. Additionally, for the low SES group, there was no significant main effect of training for this measure. However, this sample of low SES children demonstrated the same pattern of results as the ESL sample of children for Letter-Sound Identification and for the phonological awareness measures. Thus, the training group significantly outperformed the control group on posttest scores on Rime Detection and Sound Blending, and the effect of training on pretest-posttest scores approached significance for Syllable Deletion. Additionally, the training group significantly outperformed the control group on posttest scores for Initial Phoneme Detection. These results support the findings from other intervention studies, demonstrating that instruction in phonological awareness linked with instruction in the alphabetic principle (letter-sound knowledge) is successful in low SES L1 and L2 children (Aram & Biron, 2004; Bradley & Bryant, 1983, 1985, 1993; Bus & van IJzendoorn, 1999; Byrne & Fielding Barnsley, 1991; Hatcher et al., 2004; Gerber et al., 2004).

The significant differences between the trained and the control groups from pretest to posttest on Scarborough vocabulary subtests and Scarborough Vocabulary total demonstrate that it is possible to effectively teach vocabulary items across language status and SES samples. These items were selected based on research that found that they are not known by native English children coming from low SES families, as well as by ESL children, before they start school (Scarborough, 2003). Although the children in the trained group obtained lower pretest scores than the children in the control group, their posttest scores were larger than those obtained

in both pretest and posttest by the children in the control group. The pattern of growth from pretest to posttest for the ESL group for Grammatical Knowledge (TACL-3), measured by comprehension of longer complex sentences, is the same: the control condition children outperformed the trained children on pretest scores, however, they did not show any growth from pretest to posttest as evidenced by their slightly negative slope. In contrast, the trained children showed significant growth from pretest to posttest. Thus, both grammatical knowledge and specific vocabulary items can be successfully trained in young L2 (low and middle SES) children and specific vocabulary items can be effectively taught in low SES (L1 and L2) young children.

So far, the current study reveals that it is possible to effectively train phonological awareness skills, and as a result, phonetic word reading, along with specific vocabulary items and grammatical knowledge in very young ESL learners. In addition, children from different language status and socio-economic status show similar levels of learning in the current training programme for the phonological awareness measures and ESL children from different SES backgrounds show similar levels of learning for the phonetic Dolch word reading. Is this finding true for vocabulary items or grammatical knowledge across different LS or SES?

Effects of language status and SES

Significant differences were found between language groups on all the vocabulary measures (PPVT-III, Scarborough Vocabulary) and on grammatical knowledge (TACL-3). Thus, the native English-speaking children outperformed the ESL children on these measures. There were no significant effects of training or of training across time for the untrained vocabulary measure (PPVT-III). Children from the English group learnt significantly more vocabulary on a standardized measure of receptive vocabulary than children from the ESL group. Differences between the two language status groups on their response to training were reported for

Scarborough Vocabulary Total: the native English speakers were significantly better able to take advantage of the training, such that not only did they outperform the ESL children in pretest and posttest, but they also improved their scores from pretest to posttest faster than the ESL children. An examination of the four sections of Scarborough vocabulary reveals that this effect is actually perpetuated by language status group differences in growth from the Time-Order Relations subsection to the Scarborough Vocabulary total, whereas Space, Quantity or Logic Relations subsections do not show any difference of training between the two language groups across time. This result might be due to the heavy vocabulary content of the Time-Order section, as children have to attend to a whole phrase rather than to a critical word in a phrase in order to obtain correct answer (e.g. "**After** I say dinosaur, you say chair" versus "Put the dinosaur **behind** the chair").

These results reveal the effect of language status on trained and untrained vocabulary and grammatical knowledge. No effect of training was found for untrained vocabulary items. Taken together, these results demonstrate the importance of vocabulary training and the difficulty of effectively training vocabulary in a short-term programme.

It is interesting to note that no significant differences were found between the ESL groups belonging to different SES levels in terms of vocabulary growth. It is possible that this effect is due to selection bias, as children participating in the training and the control groups had parents that valued literacy, as shown by their answers in the Parent Home Questionnaire and by their commitment to the training programme. In addition, even the middle SES ESL group spoke their native language almost exclusively at home, resulting in no differences in exposure to English for the low and middle SES ESL participants.

Word repetition shows differences between control and trained language groups, such that the ESL trained children repeated a larger number of words than the ESL control children, but English speaking trained children did not perform significantly different than their control counterparts. This is probably due to the developmental effects for the English-speaking children in both the training and the control condition. The children's performance on the word repetition task in their L1 might be constrained by their working memory ability. In contrast, the ESL children were able to remember more words as a result of increased exposure to English.

Significant differences were found on both the Word Repetition (verbal short-term memory) and the picture naming speed (processing speed) if children were compared based on their language status or SES status. Thus, native English children outperformed ESL children on Word Repetition. Additionally, native English children named the same pictures faster than the ESL children. Middle SES children repeated more pairs of two words than did low SES children and named the pictures much faster than the low SES children. The LS and SES effect on Word Repetition is supported by research performed by Gathercole et al. (1997). They found that children's ability to learn the sound patterns of new words was related both to their current knowledge of the native vocabulary and to their capacity to hold phonological material for brief periods in short-term memory

Phonological awareness and reading performance

The results of the regression analysis on phonological awareness demonstrate that, for our mixed sample of native English speaking children and ESL children of preschool age coming from varied SES levels, vocabulary (PPVT-III) and pseudoword repetition (CTOPP) were not predictive. Letter-Sound Identification, Word Repetition (verbal short-term memory) and Block Imitation (WPSSI-3) (non-verbal intelligence) significantly predicted variance on phonological

awareness as measured by the composite variable of Rime and Initial Phoneme Detection, Syllable Deletion and Sound Blending (WDRB). These results are supported by other research findings. Thus, other studies conducted with ESL children found that non-verbal intelligence was related to variance on the phonological awareness tasks (Gottardo & Geva, 2005). Letter-Sound Identification performance is consistently associated with variance in the phonological awareness tasks in the research literature (Roberts, 2003). In addition, word repetition is considered one of the predictor variables of phonological awareness (Gottardo, Stanovich, & Siegel, 1996; McBride-Chang, 1996).

At the same time, vocabulary (PPVT) and pseudoword repetition (CTOPP) were not predictive of performance on the phonetic reading task. Scores on this reading measure were predicted by performance on Sound Blending (WDRB), Letter-Sound Identification and Block Imitation (WPPSI). The composite variable that measures phonological awareness at the onset rime level, although correlated with word reading, did not predict variance on this measure. Only the finer level of phonological awareness as measured by Sound Blending significantly predicted variance on the reading task scores. These results are consistent with findings from other research studies. For example, Walley, Metsala and Garlock (2003) found that phonemic awareness, developed as a result of increased reading ability, was related to early reading ability. Gottardo and Geva (2005) found that non-verbal intelligence predicted unique variance in reading scores for an ESL sample. The large effect sizes for reading reported by all the training programs that taught phonological awareness in conjunction with the alphabetic principle (Bus & van IJzendoorn, 1999) show that letter-sound identification is an important predictor of reading.

Educational Implications

The results from the current study on successful training of phonological awareness and phonetic word reading support the view that phonological awareness skills that predict or are precursors to phonetic word reading skills can be effectively taught even when the oral language proficiency skills (receptive and expressive vocabulary) are very low (Gersten, 1996). Thus, second language learners of English coming from low or middle SES families benefit from this training and can equally achieve the first phase of reading, decoding. Additionally, native English-speaking children benefit from the training of the phonological awareness skills. Therefore, the question regarding the need for a certain level of vocabulary for successful training of phonological awareness receives the following answer from the current study: Phonological awareness can be effectively taught even when young second language learners display very little oral language proficiency in that second language. The results of the current study do not address the issue of achieving the second phase of reading, reading to learn, as the participants were still too young on posttest (mean age was 48.5 months). In this later stage of reading development, vocabulary becomes important and significantly predicts variance in reading scores (Chall, 1996; Snow, 1997).

At the same time, the current study demonstrates that specific vocabulary items can be effectively trained in an eight-week intensive program. Children that come from socio-economically disadvantaged families lack knowledge of critical vocabulary concepts in the domains of space relations, time/order relations, quantity and logic relations, knowledge necessary to understand classroom instruction (Scarborough, 2003). There is not much research pointing to the relationship between children's language status and the lack of knowledge of these critical vocabulary items, but it is generally accepted that children learning a second

language usually show lower levels of general vocabulary proficiency in that second language when compared with native speaking children (August et al., 2005; Geva & Farnia, 2005). Our study shows significant differences between groups by their language status on the four subtests of Scarborough vocabulary, as well as on the Scarborough Total scores, with native English-speaking children largely outperforming the ESL children. However, the children in the training condition showed significantly larger growth from pretest to posttest than the children in the control group on this measure. Thus, the initial effect of language status does not translate into differences in the training effect for Scarborough Vocabulary.

The same pattern of an effect of language status was found for Vocabulary (PPVT-III) and Grammatical Knowledge (TACL-3) for our sample: the native English-speaking children performed higher than the ESL children across time. Since the gap between vocabulary knowledge for normative versus advantaged populations tends to increase in time (Biemiller & Slonim, 2001; Pan et al., 2004) and since vocabulary plays a crucial role in later stages of reading development (Cunningham & Stanovich, 1997; Catts et al., 1999), it is important to foster vocabulary acquisition in the early years. The positive effect of training specific vocabulary items did not extend to untrained vocabulary. Similar results of differential effects for trained versus untrained vocabulary have been reported for French vocabulary growth in French Immersion kindergarten children (Wade-Woolley, 2005). This result is also consistent with research reporting no significant impact on reading comprehension for primary years programs such as Reading Recovery (Gregory et al., 1993) and for the Success for All (Madden et al., 1993).

For the ESL children, the main effect of SES was significant only for Word Repetition, pseudoword Repetition (CTOPP, 1999) and Picture Naming Speed in the current study. The

research literature suggests that children coming from low SES families show lower levels of oral language proficiency than their middle SES counterparts (Hart & Risley, 1992; Snow et al., 1998). They also tend to come from the families that value literacy less than children from middle SES families. These results are not supported by findings from the current study. No main effects of SES were found for any of the measures of English vocabulary. As mentioned earlier, this result might be confounded by the larger number of native English-speaking children compared with the number of ESL children in the low SES sample. However, the parents of the children participating in the program reported that they value literacy; they also showed great commitment to the program, with many of them even attending the sessions. They reported that they helped their children read the assigned phonetically controlled books at home; they practiced naming the sounds of the letters, counting the words in the sentences and the syllables in the words with their children. By taking a real interest in their child's success in the program, these parents offered a variety of literacy stimulating experiences and offered a great deal of emotional support to their children. Thus, they altered the proximal variables influencing their children's outcomes. Although the distal influences of low SES are known to have a negative impact on children's outcomes, these distal influences are exerted through the proximal variables. As those parents had changed those proximal influences, they had a positive impact on their child's achievement. Thus, it can be said that SES differences for the ESL children were reduced in this sample.

To conclude, precursors of decoding, such as phonological awareness and letter-sound identification skills, can be successfully trained in various LS and SES groups of very young children (3 ½ to 4 ½). Specific vocabulary items, such as Scarborough vocabulary, can be effectively trained as well in such a sample. There is a continued need for effective general

vocabulary training, as large differences in vocabulary knowledge and acquisition exist between children from various SES and LS status. These differences are known to exert an important effect on later stages of reading (Chall, 1996; Snow et al, 1998). A larger sample of low SES children with varied language status can provide more information about the patterns of vocabulary acquisition for children with varied SES and LS status.

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APPENDIX 1

Parent-Home Questionnaire

Thank you for your time, please answer the following questions.

Child's Name:

_____

Name of the centre which (s)he attends:

_____

Did your child attend school in a foreign country? *(Please draw a circle around the correct answer)*

Yes No

Which was the last grade (s)he completed at this school?

_____

What type of work does the child's father do in this country?

_____

_____

What type of work does the child's mother do in this country?

_____

_____

What was the last school grade completed by the child's father?

_____

What was the last school grade completed by the child's mother?

_____

What country is the child's father from?

_____

What country is the child's mother from?

_____

If he lived in a foreign country, what type of work did the child's father do in that country?

_____

_____

If she lived in a foreign country, what type of work did the child's mother do in that country?

_____

_____

How old was the child when (s)he began to show interest in written words and/or numbers?

_____

How did (s)he show that interest?

_____

_____

_____

How often is a newspaper acquired in your family? *(Please draw a circle around the correct answer)*

Daily Three times per week Once a week Rarely
If you acquire the newspaper, which newspapers do you acquire most often?

_____

_____

How often are magazines acquired in your family?*(Please draw a circle around the correct answer)*
Daily Three times per week Once a week Rarely
If you acquire magazines, which magazines do you acquire most often?

_____

_____

What languages are spoken in your home?

_____

_____

Which people speak these languages?

_____

_____

What language is spoken most frequently in your house?

_____

Please draw a circle around the correct answer

Do you have more than 25 books at home?
Yes No
Do you read out loud to your child every day?
Yes No
Do you read the same book to your child many times if the child asks you?
Yes No
When you read to your child, the child sits on your lap or very close to you and is in a position to follow the reading of the book?
Yes No
Did any other adult read to the child before the child began attending The Ontario Early Years Centre?
Yes No
Besides yourself, is there another adult living at home?
Yes No

Please draw a circle around the answer that most indicates how true the following declarations about you and your child are.

During her/his free time at home, MY CHILD reads very often
True Somewhat true Somewhat False False
Knowing how to read is very important
True Somewhat true Somewhat False False
During YOUR free time, you read very often.
True Somewhat true Somewhat False False
YOU enjoy reading very much
True Somewhat true Somewhat False False

Thank you very much. Once it is completed, please send this questionnaire back to the centre with your child.

APPENDIX 2

Relational Terms (Scarborough, 2003)

Provide the following instructions to the child. Mark as either 1 (correct) or 0 (incorrect). For the first 5 items, you can provide feedback, e.g. "Nice try, this is put the chair on top of the book". Discontinue providing feedback after the fifth item. For each set, discontinue testing after **six consecutive** errors. Circle the answer given by the child or write down his/her actions.

A. SPACE RELATIONS

1. Put the chair on **top** of the book
2. Open the **bottom** drawer.
3. Put your hands **up**.
4. Go **under** the table.
5. Jump **over** the book. **(have a book on the floor)**
6. Put your hands **down**. **(have the child reach above first)**
7. Put the pen **below** the book.
8. Turn the chair **upside-down**.
9. Put the dinosaur **in front of** the chair.
10. Reach **above**.
11. Put the dinosaur **on your left.**
12. Stand **beside** the chair.
13. Put the dinosaur **behind** the chair.
14. Put the chair **on your right.**
15. Put the dinosaur **next to** the chair.
16. Reach **across** the table.
17. Sit the dinosaur **far from** the chair.
18. Jump **toward** me.
19. Sit the dinosaur **away from** the chair.
20. Put the dinosaur **near** the mirror.
21. Go **around** the chair.

22. Put the chair **by** the mirror.

23. Move the chair **in the back** of the room.

24. Put the drawer **on the side.**

B. TIME/ORDER RELATIONS

1. Don't stand up **until** I say "**name of child**"

2. Touch the toy in the **middle.**

3. **Whenever** I say 1, you say 2. 1 (look expectantly)..., 1 (same)....1 (same)....

4. Touch the toy at the **beginning** of the row **(have the toys aligned in a row)**

5. Give me the chair, the mirror, the dinosaur and the drawer **(make sure you have more than the 4 toys on table)**. **First**, give me the mirror. **Second,** give me the chair. **Last**, give me the dinosaur.

6. Give me the dinosaur. **Next**, give me the chair **(have the toys aligned in a row)**

7. Give me the toy **next to the last** one.

8. **After** I say dinosaur, you say chair. Dinosaur, (wait for response, look expectantly)....

9. **When** I say baby, you say cup. Baby, (look expectantly)...

10. Give me the toys **from the dinosaur to the chair (have the toys in a row, one toy before the dinosaur, one in the middle, one after the chair).**

C. QUANTITY

1. Give me **all** of the toys.

2. Circle **each** of the cats.

3. Give me **some** of the toys.

4. Circle **most** of the cats.

5. Give me **a few of** the toys.

6. Circle **any** of the cats.

7. Give me one toy. Give me **more** toys.

8. Touch **none of** the chairs.

9. Give me **no** chairs.

10. Draw **a little** line.

D. LOGIC

1. Give me the **same** **(have 3 objects on table, 2 identical)**
2. Give me the ones that are **alike** **(same as above)**
3. Touch the one that is **similar** **(have three objects on table, one that is identical to one on the table in your hand)**
4. Circle that one that is **different.**
5. **If** I give you a dinosaur, **then** you give me a chair **(proceed by giving the dinosaur)**
6. Give me the chair **or** the dinosaur.
7. Give me **exactly** 2 toys.

APPENDIX 3

Session plan for Tuesday, April 19 (Kitchener)

- kids will have name tags on them

1) **all group together** – Hello song, teacher's names presented only, teachers model getting their matched name from the middle **(5 min)**

2) **break into the 2 small groups** – Hello song is continued – each child says or points to his name tag + match their name with the card in the middle (Go find your name) – if necessary, kids will be helped to find their names **(10-15 min)**

3) listening games – CD (Confi dance) – everybody performs the motions requested by the music **(10 min)**

4) **break down into 2 small groups** – listening games **(10-15 min)** – our world is filled with sounds; we can listen with our eyes closed (demonstrate) or open (demonstrate); repeat eyes closed and open, while demonstrating it

- if I close my eyes and listen, I can hear (breathing, clocks, voices, wind blowing, fan etc); now try to listen with your eyes closed, after a few minutes, ask the children to name a few sound that they heard (do not ask individually)

- now everybody closes their eyes and listen to the sounds that I make, then try to tell me what noise I made; group answers to encourage participation in the first sessions (7-10 noises, or until children's attention is starting to fade); one sound at a time, in this session → 2 sounds at a time (first we heard a …, then we heard a …) in the following sessions; encourage individual participation + switch from responses from whole group to responses from individuals, to encourage listening and paying attention; try to note every child's progress and difficulties, report them at the end of session → to create extra opportunities for children that are having trouble expressing their responses

  → 3, 4 sounds at a time → make a sequence, then omit a sound – ask children which sound was omitted

NOISES:	banging on wall, table, lap	clapping
	blowing, blowing nose, blowing a whistle	eating an apple
	stamping	hammering

clicking with tongue	hopping
closing purse	noisy chewing
coloring hard on paper	pouring liquid
coughing	scratching
crumpling paper, folding, tearing paper	sharpening a pencil
cutting with a knife, with scissors	slamming a book
dropping various things	smashing blocks
drumming with fingers	snapping fingers
rubbing things together	smashing crackers
opening window or drawer	tiptoeing
stirring with teaspoon	walking
turning on computer	whistling
writing on board	writing with a pencil

5) **all group together – snack time** – target food labels by providing those labels (now we are going to have some fruit – model – some vegetables – model – water and crackers (model)and by waiting for children to ask for the food items; label different noises that we can hear while eating and getting snacks ready (pouring, chewing, etc) – **10 –15 min**.

6) **children-led play time** – now it is time for you to play, choose any of 2 activities presented (kitchen centre and blocks) – interact with children while they are playing, by providing labels and requesting information from children (What is this? What are you doing here? What color? What shape? What do we do with…? Where do we use, put etc..?) – **10-15 min**.

7) **small groups – nursery rhymes with books – 10 min** - Jack and Jill, Twinkle, twinkle little star –

- first read it emphasizing its rhythm and exaggerating its rhymes
- introduce the concept of rhymes (Jill and hill rhyme, as they end up with the same sounds, they sound the same at the end, Jill – hill), repeat for every obvious rhyme (down – crown), then try water– after;
- repeat the nursery rhyme in the small group a few times, so the children can learn it - reread it line by line, the children will repeat each line in unison, the pace is slow and

deliberate at first, gradually picking up speed – this is going to be used later on to identify nonsense (by changing the words or the order of words in the nursery rhyme - e.g. Jack and Jill went up the sky, up the car etc) and to determine if the rhyme still exist when changing words

- go back to the concept of rhyme, "now I am going to recite the poem, pay attention to the rhymes" – recite the poem in whispers, but say the rhyming words out loud; stop after the rhyming word and ask children which words rhyme

8) **small group – introduce the musical instruments - 10 min**. – we have some musical instruments here. Let the children play with the instruments, then say, now everybody listen. Some of these instruments make similar sounds, some make very different sounds. For example, (child name) has a (label the instrument), and ….has a …These instruments make similar sounds (maracas-sand paper blocks; bell-triangle; wooden blocks). Demonstrate while talking, then accentuate: similar sounds, and demonstrate again. But …(name of child) has a….and ….has a …..A …and a …. make different sounds (demonstrate while talking, then accentuate: different sounds, and demonstrate again).

- ask children to tell if different instruments make similar or different sound, switch from group answers to individual answers;
- we'll tidy up these instruments now.

9) **small group – clapping the beat – 10 minutes** - now we'll recite the rhyme together, but we'll clap the beat with our hands;

- then we'll mark the beat with our musical instruments

10) **all group together – 10 min. - marching and clapping the beat on a different nursery rhyme** – If you're happy and you know it, clap your hands

11) **good bye song** – kids put their name tags in the middle, starting with teachers that demonstrate the activity

APPENDIX 4

Session plan for June 7 (Kitchener)

- kids will have name tags with them

1) **all group together** – 10 min - Hello song – each child says or points to his name tag + match their name with the card in the middle (Go find your name) – if necessary, kids will be helped to find their names

- All of the kids will have their name's last letter missing from their card, they are given a few letter stickers and asked to figure out which one is the one they need

2) Hearing words in sentences – 10 min – with blocks (one block for each word) – 2-3 word sentences at beginning, avoid prepositions (in, on, at etc)

- model the required thought process for the children, showing them how to repeat your sentence to themselves word by word, with clear pauses between each. Encourage the children to arrange the blocks from left to right to establish directionality

- after arranging their blocks, the group or an individual should be asked to repeat the sentence, pointing to each block while saying the word it represents

3) **small group - introduce sounds related to letters** – 10 min

Teach H, N, U using the bingo boards; maintain G, R, I, T, A, C, D, O, F, S, M, B by labeling the sounds as their letter symbols will go on a basket; one of the children takes one thing from a bag and tries to find the basket that has its beginning sound on it;

Word puzzle – use words that can be formed with known letters/sounds (cat, dad, and, sad, dot, sub, mat, bat, bus, mad, hot, rat, etc)

4) **memory games with Dolch words** – 10 min

- use only 4 pairs of words to start, show that the cards are the same, demonstrate the game; have the kids take turns into matching 2 cards at a time etc

5) **small group –** take one thing from the box (need a box will small objects or pictures of various objects that differ in the number of syllables in their name)

- invite one student to close his eyes, choose an object from the container and name it (it is a pencil); all children repeat the chosen object's name as they clap out its syllables, then ask how many syllables were heard (they can use their fingers to count them) have baskets with numbers written on them and ask the children to match the no. of syllables with the basket that has that no. on
- this activity will continue in coming session by asking the children to hold 2 fingers horizontally under their chins, so they can feel the chin drop for each syllable -

6) **small group –musical instruments - 5 min** – and marking the beat by marching and banging etc on the instruments
- marching and clapping the beat on a different nursery rhyme – USE THIS ANY TIME CHILDREN NEED TO GET BACK ON TRACK (ie, when you feel that you are losing their attention etc)

– nursery rhymes with books – 5 min
- first read it emphasizing its rhythm and exaggerating its rhymes
- introduce the concept of rhymes (Jill and hill rhyme, as they end up with the same sounds, they sound the same at the end, Jill – hill), repeat for every obvious rhyme (down – crown), then try water– after; use picture cards that have 2 words that rhyme on them;
– this is going to be used now to identify nonsense (by changing the words or the order of words in the nursery rhyme - e.g. Jack and Jill went up the sky, up the car etc) and to determine if the rhyme still exist when changing words
- go back to the concept of rhyme, "now I am going to recite the poem, pay attention to the rhymes" – recite the poem in whispers, but say the rhyming words out loud; stop after the rhyming word and ask children which words rhyme
Rhyme booklets

7) **small groups – snack time** – target food labels by providing those labels (now we are going to have some fruit – model – some vegetables – model – water and crackers

(model)and by waiting for children to ask for the food items; label different noises that we can hear while eating and getting snacks ready (pouring, chewing, etc) – **10 –15 min**.

8) **children-led play time –25 min**. – transition to the Blue Room -
- now it is time for you to play, choose any activities presented - interact with children while they are playing, by providing labels and requesting information from children (What is this? What are you doing here? What color? What shape? What do we do with…? Where do we use, put etc..?)
The following kids will work together with the following teachers on concepts, using the toys chosen by children (reports to be made about child's progress):
Iuliana – Lindsay, Marvin, Ali – rhyme and sounds to letters - 10 min
Iuliana – Adrian, Aiden - rhyme and sounds to letters – 10 min
Brandy — Mosca, Ricardo - rhyme concept – 10 min
Brandy – Alyssa – rhyme concept – 10 min
Leanne – Belen - rhyme concept -10 min
Leanne – Ziyi – rhyme concept – 10 min

9) small group – transition to the Workshop room no 2 - – 10 minutes – review concepts learned today: rhymes, same/different sound; sounds that different words start with – exemplify with pictures of these words and letter symbol – Nicole/Leanne responsible
Today we've learnt about rhymes and about same and different sounds
Words that end up with the same sounds are words that rhyme + demonstrate
Same/different sounds + demonstrate
10) **good bye song** – kids put their name tags in the middle, starting with teachers that demonstrate the activity

Extra activities
1) **Simon says** – use of space relations (on, under, in, on top, below, in front of, on your left, beside, behind, on your right, etc) -**10 min** – for example, Simon says, "Put the pencil on top of the book"

2) **small groups – Jacob, where are you?** – children will locate the source of a sound by listening only